Emotional Perception as a Component of Emotional Intelligence: Its Role in Academic Achievement, Social Interaction, and Focus of Attention

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Abstract

The ability to perceive emotion in others has been proposed as an important component of emotional intelligence (EI). Indeed, perhaps the only independent aspect of EI which is not simply a manifestation of personality or cognitive ability.

This thesis investigates the status of emotional perception (EP) within the EI framework. Chapter 1 discusses a number of controversies within the EI literature and identifies EP as the most important aspect of EI. Chapter 2 describes the difficulties with the measurement of EP and evaluates its potential theoretical contributions. It then reports the development and validation of a scale designed to measure EP.

Successive Chapters investigate the influence of EP in three main theoretical areas. First, the role of EP in academic performance and its potential longitudinal effects are evaluated in two longitudinal studies. EP is compared with scales measuring other aspects of EI, a personality inventory, a measure of cognitive ability, a well-being scale and a coping scale in order to assess the reliability and validity of the measures, and to evaluate their inter-correlations. Additionally, the relationship between EP and various types of academic achievement is explored in order to assess the predictive validity of EP. Second, a quasi-experimental design is employed in order to investigate the role of EP in social interaction. The experience of embarrassment when delivering class presentations is used to investigate these effects. Third, a series of experimental studies, using the attentional bias framework, consider the effects of EP on the focus of attention to emotionally meaningful stimuli.

The thesis presents evidence to suggest that EP is a semi-independent construct within EI. It can be assessed reliably, demonstrates validity, is a practically useful construct, and influences moment-by-moment regulation of behaviour.

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Chapter 1

General Introduction

"All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident."

(Schopenhauer, German philosopher)

There has been an explosion of interest in the topic of Emotional Intelligence (EI) during the past decade. The term EI was first coined by Salovey & Mayer (1990) who defined it as:

"the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions" (Salovey & Mayer, 1990, p.189).

The term EI was popularised in Daniel Goleman's influential book:

"Emotional Intelligence: Why it can matter more than IQ" (Goleman, 1995)

and its surrounding publicity. Since then, a wide range of, predominantly popular, books and articles have examined the nature and development of EI at both the individual and occupational level and both have received intense media attention.

There are several reasons for the rise of interest in EI. One explanation is that EI fits in well with today's contemporary society which is concerned with caring attitudes and environmental responsibility. Second, the topic is appealing as it implies that people with high EI, even if lacking in cognitive intelligence may still be highly successful in life. Third, the failure of intellectual intelligence (IQ) to account for a large proportion of variance in performance has resulted in the search for other characteristics, such as EI, that may also influence performance (discussed later in the Chapter). Finally, EI may have become popular due to the claims that it can make us happy, rich, healthy and successful. Such claims need to be reviewed and investigated scientifically.

This Chapter examines the role of emotion and cognition within traditional views of intelligence which lead to the development of the EI concept. It presents a critical analysis of current theories of EI, discusses measures purporting to assess the

whole concept of EI, examines whether EI may represent a construct which is independent from cognitive and personality factors and discusses the role of EI in performance.

The Age of Reason

"The more bureaucracy is dehumanised, the more completely it succeeds in eliminating from official business love, hatred and all purely personal, irrational and emotional elements which escape calculation." Weber (1948)

For many years the study of intelligence primarily focused on the rational, objective function of cognition (e.g., Piaget, 1972). In conjunction with this, traditional views have classified emotions as being disorganised, irrational disturbances of the mind which should be controlled. Somewhat ironically, as illustrated in the quote above, this actually makes emotion the centre of the theory of bureaucracy rather than its periphery. It is because emotion is so important in human activity that organisations must impose rules and regulations upon it. Rationality is the artificial construction which human beings have developed in order to pursue their ends most effectively. This way of thinking lead to the development of the harsh business ethos and "tough love" so common during the 1980's.

The Age of Passion

"The balance of our lives has one scale of reason, another of sensuality, blood and raging motions." Othello, Act 1 Scene 3

More recently, there has been a realisation that emotion and cognition are inextricably linked and that we cannot afford to choose between the head and heart, anymore than we would choose to walk on one leg or see with one eye. Researchers such as Gardner (1983) and Sternberg (1988; 1999) have suggested taking a wider approach to understanding intelligence, and emotions have emerged as having organisational and adaptive properties which may be crucial in the management of actions (Damasio, 1994). These two developing lines of thought have brought the concepts of emotion and intelligence closer together, and researchers have attempted to incorporate EI within the traditional intelligence framework (e.g., Ciarrochi, Chan, & Caputi, 2000; Dawda & Hart, 2000; Goleman, 1995; Salovey & Mayer, 1990). Evidence from neuroscience adds further weight to the argument that cognition and

emotion are inextricably linked, with neither being able to function fully without some input from the other (e.g., Damasio, 1994).

Different approaches to emotional intelligence

Research evidence suggests that EI consists of a set of related adaptive abilities: verbal and nonverbal appraisal and expression of emotion in the self and others, regulation of emotion in the self and others and use of emotion to guide thinking and facilitate performance (e.g., Davies, Stankov, & Roberts, 1998; Martinez-Pons, 1997; Mayer & Geher, 1996; Salovey & Mayer, 1990). Within this framework of adaptive abilities it has been proposed that EI consists of a number of underlying components, often referred to as factors. There is some debate over the nature of these components and no agreed consensus as to how many there are. A number of the different approaches to EI are summarised in Table 1.1.

Salovey & Mayer (1990) for instance, suggested that EI consists of three categories of adaptive abilities relating to self and others: appraisal and expression of emotion, regulation of emotion and utilisation of emotion in solving problems. Mayer & Salovey (1997) revised this original model of EI to place more emphasis on the cognitive components of EI and conceptualise EI in terms of potential for intellectual and emotional growth. The revised model consists of four branches of EI: perception, appraisal and expression of emotion, emotional facilitation of thinking, understanding, analysing and employing emotional knowledge and reflective regulation of emotions. The perception, appraisal and expression of emotion are viewed as the most basic processes, while the reflective regulation of emotions requires the most complex cognitive processing. The Four Cornerstone Model of EI (Cooper, 1997), suggests that it consists of four components: emotional literacy, emotional fitness, emotional depth and emotional alchemy, which represent the driving force behind competitive advantage in the workplace. Goleman (1998) analysed job competencies in 121 organisations, and proposed that EI consists of self-awareness, self-management, social awareness and social skills. Dulewicz & Higgs (1999) suggest EI is linked to competencies and developed a conceptualisation of EI based on a 7-year follow-up study with general managers. They postulate that EI consists of seven competencies: self-awareness, conscientiousness and integrity, motivation, emotional resilience, decisiveness, influence and interpersonal sensitivity.

Table 1.1 Different approaches to emotional intelligence.

Components of EI	Researchers
Self-awareness	(Dulewicz & Higgs, 1999; Goleman, 1998; Mayer & Salovey, 1997; Salovey & Mayer, 1990)
Appraisal and Expression	(Mayer & Salovey, 1997; Salovey & Mayer, 1990)
Perception	(Davies et al., 1998; Mayer & Salovey, 1997)
Understanding/Clarity	(Goleman, 1998; Mayer & Salovey, 1997; Salovey & Mayer, 1990)
Regulation	(Mayer & Salovey, 1997; Salovey & Mayer, 1990)
Management/Utilisation	(Cooper, 1997; Goleman, 1998; Mayer & Salovey, 1997; Salovey & Mayer, 1990)
Motivation	(Cooper, 1997; Dulewicz & Higgs, 1999)
Social/Interpersonal skills	(Dulewicz & Higgs, 1999; Goleman, 1998)

Criticisms of these approaches include the fact that much of the evidence proposed has been anecdotal and many studies have not measured related constructs such as cognitive, social and intellectual processes. As a result, it is unclear whether EI is simply a loosely connected set of abilities measuring aspects of personality and cognition and we are left wondering whether EI is unitary, factorial, or if it even exists at all.

More recent research has shown that the concept of EI may be far narrower than proposed by many current theoretical models. For example, Davies et al. (1998) used a relatively large sample (total N = 530) to explore the concept of EI in a series of three studies. Participants were presented with self-report measures of EI, "objective" measures of EI (such as facial expressions and excerpts of music), personality questionnaires, fluid and crystallised intelligence tests and social intelligence measures. The results of these studies suggest that the concept of EI is limited by the tests used to measure it and it was concluded:

"as presently postulated, little remains of emotional intelligence that is unique and psychometrically sound." (Davies et al., 1998, p.1013)

However, their data provided some evidence for the existence of an independent emotional perception (EP) factor representing the ability to monitor another individual's emotions. Indeed, they argue that EP is perhaps the only aspect of EI which is independent from personality and cognitive ability. Investigating the status of EP is the focus of the thesis.

Applications of emotional intelligence

EI has been proposed to have applications in a number of important areas in everyday life, including well-being and health, happiness, work, education, interpersonal relationships, psychiatry and financial decisions (Ciarrochi, Forgas, & Mayer, 2001). A selection of these potential applications are outlined in this section.

In terms of well-being, health and happiness, people who can understand, regulate and manage their emotions should be able to maintain a better outlook on life and experience better emotional health. Research has shown that poor management of emotions can lead to health problems such as heart disease and makes individuals vulnerable to stress (Mayer & Salovey, 1997). EI abilities have also been associated with positive mood and higher self-esteem (Schutte, Malouff, Simunck, McKenley, & Hollander, 2002), less depression (Martinez-Pons, 1997; Schutte, Malouff, Hall, Haggerty, Cooper, Golden, & Dornheim, 1998), and greater optimism (Schutte et al., 1998).

EI has been shown to be highly correlated with self-actualisation (e.g Bar-On, 2001; Goleman, 1998). Self-actualisation consists of a number of aspects. These include the ability to actualise potential, enrich life, to set and achieve goals and commitment to interests. EI has been shown to be a more important predictor of self-actualisation than IQ. This suggests that emotionally intelligent individuals are able to actualise their potential in life even if their cognitive intelligence is relatively low. Just as EI components such as self-awareness, effective problem solving and motivation influence the ability to actualise our potential, self-actualisation influences general well-being and health as well as effectiveness at work (Bar-On, 2001).

EI abilities appear to be involved in maintaining happy long-term relationships. Marital researchers have demonstrated that the better spouses are at perceiving, accurately identifying, expressing and regulating emotions, the happier and more stable their relationships are (Fitness, 2001).

EI has an important role to play in education. In order for individuals to succeed in life, it seems that EI skills are just as important as traditional cognitive abilities (Goleman, 1995). Indeed, recognition of this has lead to the implementation of a wide range of social and emotional learning programs in schools, resulting in positive outcomes (e.g., better teaching, less aggression and drug usage). It is emphasised that both teachers and parents must be trained in the implementation of EI skills in order for such programs to be most effective (Elias, Hunter, & Kress, 2001).

The potential role of EI in performance, both in terms of occupational success and academic achievement, is discussed in a separate section later in the Chapter as this area is of more relevance to the thesis.

To summarise, it appears that EI abilities are essential to maintaining happy, healthy and successful lives. Many bold claims have been made regarding the potential applications of EI, but thorough, scientific investigation of these claims is still in its infancy.

Measuring emotional intelligence

There are a number of measures claiming to assess various components of EI, which are discussed in detail in Chapter 3, but there are a limited number of measures that purport to assess the whole concept of EI. Four of the more widely known are reviewed in the following section and a summary is presented in Table 1.2 below.

Bar-On Emotional Quotient Inventory (EQ-I, Bar-On, 1997)

In contrast with researchers such as Mayer & Salovey (1997) who believe in the importance of connecting:

"emotions with intelligence (in order to ensure) the meanings of the two terms are preserved" (p.3)

Bar-On (1997), defined EI as:

"an array of non-cognitive capabilities, competencies and skills that influence one's ability to succeed in coping with environmental demands and pressures" (p.14).

Using this definition Bar-On developed the EQ-i, a 133-item self-report inventory to assess EI. Items are summed to yield a total score, which reflects overall EI, scores on 5 higher order composite factors (Intra-Personal, Inter-Personal, Adaptability, Stress Management, and General Mood) and 15 lower-order component scales (Emotional Self-Awareness, Assertiveness, Self-Regard, Self-Actualisation, Independence, Empathy, Interpersonal Relationships, Social Responsibility, Problem Solving, Reality Testing, Flexibility, Stress Tolerance, Impulse Control, Happiness and Optimism). A substantial body of research, summarised in the EQ-i manual, indicates that the scales generally have good internal consistency (alpha coefficients range from 0.69 to 0.86 across 10 studies) and test-retest reliability. Factor analysis also provides some support for the hypothesised structure of the EQ-i. Further unpublished reports cited in the EQ-i manual suggest that scores on various sub-scales have been used to discriminate between academically successful and unsuccessful students and successful and unsuccessful US Air Force recruiters (Bar-On, 1997). More recent research also provides evidence for the EQ-i identifying differences

between police officers and care workers in relation to occupational stress (Bar-On, Brown, Kirkcaldy, & Thomé, 2000).

Although heralded as being a comprehensive account of EI, there are a number of limitations with the EQ-i. First, the measure shows considerable overlap with traditional measures of personality (detailed in the later section looking at the relationship between EI and personality).

Second, the EQ-i does not appear to be related to cognitive ability, but the EQ-i manual claims that it is related to successful academic outcomes (Bar-On, 1997). As part of their study, Newsome, Day, & Catano (2000) examined whether the EQ-i would account for variance in academic achievement scores after controlling for cognitive ability scores. Individual scores on personality were also controlled to assess whether the EQ-i was measuring aspects of personality (not measured by more traditional personality measures) that are related to academic achievement. Results showed no support for the predictive validity of the EQ-i. While both cognitive ability (assessed by the Wonderlic) and personality were significantly associated with academic achievement (Grade-point averages), neither the total EQ-i score nor the 15 sub-scales were significantly correlated with Grade-point average. Correlation coefficients ranged from –0.13 to 0.10 (see later section on EI and academic achievement). Consequently, even if we accept Bar-On's view that EI is embedded within the personality framework, the 16PF still does a better job of predicting academic achievement.

Third, even though the EQ-i consists of 133 items and 15 sub-scales, a further criticism is that it fails to address the component of EP. Considering EP has been argued as potentially being a semi-independent construct within the EI framework (Davies et al., 1998), a measure purporting to assess all aspects of EI is hardly complete without this component.

33-item measure of emotional intelligence (Schutte et al., 1998)

Schutte et al. (1998), developed a 33-item measure of EI based on the original model of EI developed by Salovey & Mayer (1990). The scale purportedly measures:

> *"a homogeneous construct of emotional intelligence"* (p.175).

The scale was found to be reliable with a Cronbach's alpha of 0.90. It showed good test-retest reliability over a two-week period (0.78), proved to be different from cognitive ability as measured by the SAT, [r(41) = -0.06, n.s.], showed discriminant validity over and above personality measures (scores were significantly related to

Openness but not to any of the other big five dimensions, detailed in the section below on the relationship between EI and personality) and showed evidence of predictive validity as scores on the EI scale significantly predicted grade point average at the end of the year, [$r(63) = 0.32$, $p < 0.01$]. Factor analysis showed the 33-item measure had a one factor solution allegedly assessing a general EI factor. However, as pointed out by Petrides & Furnham (2000) this factor solution leaves 82.6% of the total variance still unexplained and uses only 33 of the original 62-items. A unifactorial solution suggests that the scale has not been successfully mapped onto Salovey & Mayer's (1990) model of EI as it would be expected to have three factors corresponding to the three subdomains of Salovey & Mayer's original EI model. Following a re-analysis of the scale, Petrides & Furnham (2000) found it did not have a unitary solution but consisted of four factors. These factors accounted for 40.4% of the total variance and were labelled: 'optimism/mood regulation', 'appraisal of emotions', 'social skills' and 'utilisation of emotions'. This solution fits better with Salovey & Mayer's original model, but still does not map on exactly as 'social skills' represents an additional factor. This suggests that the scale does not successfully sample the three sub-domains of EI proposed in the original model. A further criticism pertains to the scale not containing items relating to important aspects of EI such as EP and emotional clarity. The scale constructed by Schutte et al. (1998) has not been widely applied and the only supporting evidence appears to be from the authors themselves.

Multifactor Emotional Intelligence Scale (MEIS, Mayer, Caruso, & Salovey, 1999)

In an attempt to improve on the weaknesses of self-report measures of EI, Mayer et al. (1999) have developed an "objective" measure of EI called the Multifactor Emotional Intelligence Scale (MEIS). The test is objective in that there are correct answers based on pre-determined scoring criteria. The MEIS consists of 12 scales divided into four hierarchical branches of EI. The perception and appraisal of emotion is the most basic branch of EI and is measured by having people identify emotion in faces, stories, designs and music. The second branch involves the ability to assimilate emotions into perceptual and cognitive processes, including weighting emotions against one another and against other sensations and thoughts, and allowing emotions to direct attention. The third branch of EI involves reasoning about and understanding emotions. High EI people know, for example, that anger often changes to sadness and that emotions can combine together to result in certain feelings. The forth and highest branch of EI involves the management and regulation of emotions in oneself and others, such as knowing how to remain calm when provoked or being able to alleviate the anxiety of another person. Factor analysis of the MEIS suggests that

the four branches can be reduced to three factors, namely perception and appraisal of emotion (branch 1), understanding emotions (combining branches 2 and 3), and managing emotions (branch 4).

The MEIS sub-tests can be scored in one of three different ways. The first, favoured by the authors, involves determining how closely a participant's answer matches a consensus answer. For example, if most people think a particular face is expressing a great deal of happiness, then it is assumed that it does indeed express a great deal of happiness. People who do not judge the face to express happiness are 'less correct' than others. A second way is based on judgements made by a panel of experts. Participants who agree with the expert judgements tend to get higher scores than those who do not agree. The third scoring criterion is based on the extent to which the participant guesses how a target (e.g. musician) was feeling at the time they were engaged in an activity (e.g., playing music).

The MEIS has two main strengths over previous tests of EI. First it is based on actual performance as opposed to self-reported performance, thus may be less subject to social desirability and does not require people to have insight into their own EI. Second, the measure samples a wide range of behaviours, from perceiving emotions in faces to identifying the best course of action to manage someone else's emotions. The sub-scales have generally been shown to be reliable, with most alpha coefficients exceeding 0.70, although two of the understanding emotions sub-scales, namely the blends and progressions tests, were found to have alpha reliabilities of 0.49 and 0.51 respectively. Finally, the MEIS has been shown to correlate with a number of theoretically related constructs, including cognitive ability (verbal IQ), empathy, life satisfaction, and parental warmth (Mayer et al., 1999). On the basis of this evidence, it would appear that the MEIS is a potentially useful instrument for measuring EI. However, most of the supporting evidence has been generated from the authors themselves and it is only more recently that the MEIS has been evaluated by other researchers.

Ciarrochi et al. (2000) critically evaluated the EI construct as operationalised by the MEIS. They examined the reliability and factor structure of the scale, investigated whether it relates to theoretically relevant variables, and examined whether the MEIS relates to important criteria and to mood biases even after controlling for existing well-established measures. In general, Ciarrochi et al. (2000) found support for the reliability and validity of the MEIS, although there were some limitations. Reliability coefficients for the sub-scales ranged from 0.35 to 0.88, but three of the sub-scales, namely the blends, progressions and managing self had reliabilities of 0.35, 0.46 and 0.43 respectively, which is somewhat lower than desirable, and is in support of Davies et al's (1998) claim that many objective measures of EI fail to reach acceptable levels

of reliability. However, the emotional factors (Overall EI, Perception, and Understanding and Management) that were derived from these sub-scales did reach satisfactory reliability with alpha coefficients of 0.90, 0.88 and 0.70 respectively. In support of Mayer et al's findings, factor analysis showed that all the MEIS sub-scales loaded on the first principle component (a sort of 'emotional g') although there was a slight difference in terms of the factor structure of the MEIS. Mayer et al. (1999) suggest a three factor solution for the MEIS, which they labelled emotional perception, emotional understanding, and emotion management; whereas Ciarrochi et al. (2000) identified two factors labelled as emotional perception, and emotional understanding and management (combining Mayer et al's second and third factors). This result could be a consequence of the lower reliabilities of the sub-scales or because only 10 of the 12 MEIS sub-tests were used (making up 90% of the total MEIS test). Nevertheless, in both studies the factors clearly overlap conceptually. In terms of construct validity, the MEIS was related to theoretically relevant variables, including empathy, self-esteem, life satisfaction and relationship quality. Importantly, the MEIS factors were still correlated with life satisfaction and relationship quality even after controlling for IQ and personality traits. In terms of discriminant validity, the MEIS showed low to moderate correlations with personality factors (assessed by the big five, detailed in the later section on the relationship between EI and personality). The MEIS was not related to cognitive ability, which was unexpected as the measure was developed from the framework of EI being a type of information-processing ability expected to share a moderate correlation with other cognitive ability factors. This result is most likely due to the fact that Ciarrochi et al. (2000) assessed performance IQ (Raven's Matrices), whereas Mayer et al. (1999) assessed verbal IQ and found a significant relationship with EI. Indeed, research (discussed in the later section on EI and cognitive ability) suggests that verbal IQ may be the only form of cognitive ability related to EI. Finally, the MEIS was related to people's ability to manage their moods, but not to their ability to prevent moods biasing their judgements. IQ was also related to both these mood processes, supporting Goleman's (1995) view that a combination of EI and IQ are important in understanding emotional processes.

In contrast to the positive findings regarding the MEIS, Zeidner, Matthews, & Roberts (2001) criticised the scoring protocols of the measure. They found a series of conflicting results depending on how the test was scored. For example, using expert scoring, males were shown to have higher EI than females, with the effect reversed for consensus scoring. Different findings between expert and consensus scoring were also found for intelligence, personality, ethnicity and the structure of the MEIS itself.

To summarise, although the MEIS shows promise as a measure of EI, it does have some limitations: some sub-scales have low reliabilities, the scoring methods are questionable and the whole test takes a long time to administer. Furthermore, at the time of developing studies for the thesis, the MEIS was not commercially available.

Mayer-Salovey-Caruso Emotional Intelligence Test, MSCEIT V.1.1 and V.2.0 (Mayer, Salovey & Caruso, cited in Mayer, Salovey, Caruso, & Sitarenios, 2003).

The MSCEIT was designed to resolve some of the problems associated with the MEIS. As with its predecessor, it has the advantage of measuring actual performance not simply relying on self-reported performance. The MSCEIT V.2.0 is a shorter version of the MSCEIT V.1.1.

The MSCEIT has one overall performance score which can be divided into sub-areas of experiential and strategic EI. The experience EI score assesses a person's ability to perceive, respond to and manipulate emotional information, without necessarily understanding it. It indexes how accurately a person can read and express emotion and how they can compare that emotion with other sorts of sensory experiences (e.g., sounds or colours). It may also indicate how a person reacts to different emotions.

The strategies EI score assesses a person's ability to understand and manage emotions, without necessarily perceiving them well or fully experiencing feelings. It indexes how accurately a person can understand what emotions signify and how emotions in oneself and others can be managed.

These two general areas can be further divided into four branches (specific skills) of EI designed to measure (a) perceiving emotions, measured with the faces and pictures tasks, (b) using emotions to facilitate thought, with the sensations and facilitation tasks, (c) understanding emotions, with blends and changes tasks, and (d) managing emotions, with emotion management and emotional relationships tasks. The MSCEIT yields a total score, two area scores (experiential and strategic), four branch scores and eight task scores. Each score can be calculated using either a consensus or expert method (as described in the MEIS section).

The MSCEIT appears to be an improvement on its predecessor the MEIS. It is more reliable than the MEIS with most of the reliabilities for the sub-scales exceeding 0.75. One sub-scale (the sensations test) had a lower reliability of 0.55. It also demonstrated two-week test-retest reliability of 0.86 (Mayer et al., 2003). The scale has the advantage of being shorter and quicker to administer than the MEIS and there are extensive norms available. Despite being shorter, it appears to measure more dimensions of EI than the MEIS (Ciarrochi et al., 2001). Finally, in response to

earlier criticisms of scoring methods (discussed in the previous section), Mayer et al. (2003) reported a correlation of 0.98 between MSCEIT consensus and expert scores.

To summarise, although the MSCEIT (particularly V.2.0) shows substantial promise as a measure of EI, because of its recent development, it suffers from a lack of scientific support. It is not yet clear whether it demonstrates validity and has utility in predicting outcomes over and above related constructs such as intelligence. These issues are acknowledged by Mayer et al. (2003) who claim that studies relating the MSCEIT to pro-social behaviour, deviancy and academic performance are in progress. Like the MEIS, the MSCEIT was not available when developing studies for the thesis.

Table 1.2 Measures purporting to assess all aspects of emotional intelligence.

Test	Alpha reliability	Strengths	Weaknesses
Emotional Quotient Inventory (EQ-I, Bar-On, 1997)	Ranging between 0.69 to 0.86 for the 15-subscales (Bar-On, 1997), and between 0.69 and 0.96 (Dawda & Hart, 2000).	Good internal consistency and test-retest reliabilities. Discriminant validity over cognitive ability.	Considerable overlap with traditional personality traits. Does not appear to offer predictive validity. Does not assess EP.
The 33-item Emotional Intelligence Scale (Schutte et al., 1998)	0.90 (Schutte et al., 1998).	Good test-retest reliability. Discriminant validity over personality and cognitive ability. Evidence of predictive validity (Schutte et al., 1998).	Unitary factor solution does not assess all components of EI. Only supporting evidence is from the authors themselves.
Multifactor Emotional Intelligence Scale (MEIS, *Mayer et al., 1999)*	Ranging between 0.49 to 0.94 for 12 sub-scales (Mayer et al., 1999). Ranging between 0.35 and 0.88 (Ciarrochi et al., 2000).	Measures actual performance as opposed to self-reported performance, sampling a range of behaviours. Construct and discriminant validity (Ciarrochi et al., 2000; Mayer et al., 1999).	Certain sub-scales fail to reach acceptable reliability. Questionable scoring methods Takes a long time to administer More extensive evaluation needed.
Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT, Mayer et al., 2003)	Ranging between 0.55 to 0.93 for 8 sub-scales (Mayer et al., 2003).	Measures actual performance like the MEIS. More reliable than its predecessor the MEIS. Measures more dimensions of EI than the MEIS but is still quicker to administer. Extensive norms available. Improved scoring methods.	Lack of research. No validity or utility evidence established yet. Not widely available.

A number of researchers (e.g., Goleman, 1995; Martinez-Pons, 1997; Mayer & Geher, 1996; Salovey & Mayer, 1990) have attempted to classify EI as an independent type of human ability involving the processing of affective information. To determine whether this is the case, the concept needs to be measured effectively and it needs to be demonstrated that EI has at least some independent status over and above other established concepts such as cognitive ability and personality, which represent the main potential confounds of EI. The following section considers the relationship between EI and these potential confounds.

The relationship between emotional intelligence and traditional measures of cognitive ability

For many years, researchers have been reluctant to integrate emotion within traditional conceptions of intelligence. However, more recent evidence suggests that emotion is not something opposed to reason and indeed, it can bridge the gap between rational and non-rational processes. For instance, Damasio (1994) studied patients who had received damage to the amygdala and found they had a deterioration in their decision-making capabilities. However, IQ tests conducted on these patients showed no deterioration in their IQ scores. Damasio therefore concluded that the patients had lost access to the emotional learning which is necessary for effective decision making and that the traditional cognition-emotion divide is fundamentally wrong.

EI has been defined as being a type of *information-processing ability* within the traditional intelligence framework (e.g., Mayer et al., 1999), and might therefore be expected to share a moderate correlation with other cognitive ability factors. Nevertheless, measures of EI should also retain some unique variance (either partial or complete) from traditional measures of cognitive ability.

Goleman (1995) reviewed the research examining the relationship between cognitive intelligence and EI and concluded:

"...there is a slight correlation between IQ and some aspects of Emotional Intelligence, but small enough to make clear that they are largely independent entities." (p.44).

Schutte et al. (1998) concluded that their measure of EI was not significantly related to cognitive ability as measured by scores on the SAT combined mathematics and verbal sections [$r(41) = -0.06$, n.s.]. However, their 33-item scale appeared to be

more about emotional awareness than other purported components of EI, so it could be argued that discussion of these results needs to be limited to an emotional awareness factor, not the whole concept in the wider sense. Similarly, the EQ-i (Bar-On, 1997), does not appear to be related to cognitive ability (assessed by the Wonderlic), but it failed to assess the component of EP.

Davies et al. (1998) found a weak link between cognitive abilities and emotional intelligence, and concluded that the only form of cognitive ability which may be related to components of EI is verbal ability. As discussed earlier, this is supported by Mayer et al. (1999), whose measure of EI (the MEIS) was related to verbal IQ. Ciarrochi et al. (2000) did not find a significant correlation between the MEIS and cognitive ability. However, they suggest that this was most likely due to the fact that they assessed performance IQ (Raven's matrices), whereas EI may be:

> *"more closely related to verbal than performance abilities"* (p.556).

The relationship between EI and verbal IQ has not yet been clearly defined. As EI appears to be about understanding emotions in self and others, verbal IQ may represent an essential part of this process. We need to be able to provide labels for EI abilities before we can begin to understand them, so verbal fluency needs to be assessed alongside EI, more so than spatial IQ for example.

To summarise, research to date suggests that at least certain aspects of EI have unique variance over and above cognitive ability. However, future research should concentrate on determining the relationship between EI and verbal ability as a component of EI reduced to verbal IQ would offer no predictive power in terms of a person's actual behaviour.

The relationship between emotional intelligence and personality

Researchers who classify EI as a type of mental ability would expect only small to moderate correlations with various personality dimensions. There is some debate over the nature of the relationship between EI and personality. The research conducted so far is often contradictory and there are limitations to some of the methods employed. This section outlines a selection of studies which have considered the relationship between EI and personality.

The EQ-i (Bar-On, 1997) appears to overlap significantly with personality. As outlined above, there were significant correlations between many sub-scales of the EQ-i and the Sixteen Personality Factor Questionnaire (16PF), ranging between 0.51

to 0.72 in several studies. Newsome et al. (2000) found that correlations between the five 16PF factors and the five EQ-i composite factors ranged from 0.01 to –0.77. Of the 25 possible correlations between the global factors of the 16PF and the five composite scales of the EQ-i, 20 were significant. Moreover, of all the 16PF factors, the EQ-i was most highly correlated with the Anxiety factor. Dawda & Hart (2000) also found considerable overlap between the EQ-i sub-scales and personality, as assessed by the NEO-Five Factor Inventory (NEO-FFI). Correlations between the five NEO-FFI factors and the five composite scales of the EQ-i ranged from –0.11 to –0.77. In support of Newsome et al's findings, of all the NEO-FFI factors, the EQ-i was most highly correlated with Neuroticism.

Part of the study conducted by Schutte et al. (1998) involved 23 college students completing a 33-item measure of EI and the revised NEO Personality Inventory. It was found that EI correlated significantly with Openness to experience ($r = 0.54$), but was not significantly correlated with any of the other big five factors. The magnitude of these non-significant but still moderate, correlations were as follows: Neuroticism ($r = -0.28$), Extroversion ($r = 0.28$); Agreeableness ($r = 0.26$) and Conscientiousness ($r = 0.21$). However, this study appears to be underpowered and it would be beneficial to consider correlations with a much larger sample.

Dulewicz & Higgs (1998a) found that their competency based measure of EI correlated significantly with the OPQ personality questionnaire ($r = 0.35$), but did not correlate significantly with 16PF ($r = 0.15$). One explanation may be that OPQ factors are linked more closely to competencies in respect of their work-related behavioural definitions than the 16PF factors. It was concluded that EI did not correlate so highly with the OPQ as to be redundant.

The MEIS (Mayer et al., 1999) appears to show discriminant validity in relation to personality. The measure, assessed by Ciarrochi et al. (2000), showed low to moderate correlations (ranging from –0.03 to 0.26) with personality factors (assessesed by the big five). Furthermore, the MEIS was unrelated to Neuroticism and of the factors, objective EP showed the lowest correlations with personality variables.

One of the aims of the study conducted by Davies et al. (1998) was to examine the relationship between various measures of EI and personality variables. They assessed six different personality types using the Eysenck Personality Questionnaire-Revised (Extraversion, Neuroticism and Psychoticism), the NEO Personality Inventory and Trait-Self Description Inventory (Extraversion, Neuroticism, Conscientiousness, Agreeableness and Openness). In contrast to much of the previous research, they conclude that self-report measures of EI have salient loadings on well-established personality measures (namely, Neuroticism, Extraversion and

Agreeableness), indicating a lack of divergent validity. Only objective measures of EP did not overlap to any great extent with personality variables.

To summarise, it is apparent that the relationship between EI and personality has not yet been clearly defined. The associations are difficult to assess with the vast number of EI scales, with various sub-scales being correlated with many different personality scales, each with their own sub-scales. Nevertheless, there appears to be a general pattern of relationships between EI and personality. Any scale developed to measure EI should be correlated with established personality measures in order to determine the relative independence of the concept.

Summary

In order to evaluate whether EI represents a type of ability with at least some independent status, in addition to its successful measurement, its relationship with established concepts such as personality and cognitive ability needs to be assessed. The majority of the research to date suggests that EI may be more closely related to personality factors than cognitive ability. The only form of cognitive ability which represents a potential confound of EI appears to be verbal IQ. This could be due to the fact that the EI construct is indeed closely related to personality variables or more likely due to the lack of well-validated self-report measures and objective measures of EI.

The predictive validity of emotional intelligence

EI has been heralded as a predictor of successful performance, both in terms of occupational effectiveness and academic achievement. It has been suggested that success in life is more a function of EI than traditional cognitive intelligence (Goleman, 1995). Indeed, as mentioned earlier, one of the major driving forces behind the development of the EI concept has been the failure of cognitive ability to account for sufficient variance in performance. It has been claimed that IQ at best contributes about 20% of the factors that determine successful life outcomes (Goleman, 1995). This is in line with findings from other researchers who have investigated the predictive power of IQ. For example, Hernstein & Murray, cited in Dulewicz & Higgs (1998a) in a study of the relationship between IQ and "broad measures of life success" conclude:

"...The link between test scores and those (broad) achievements is dwarfed by the totality of other characteristics which are brought to life." (p.66)

In an organisational setting, Bahn (1979) reported a study which was designed to assess the validity of IQ tests in predicting executive or management competency. He concluded that leaders tended to be more intelligent than the average group members, but not the most intelligent. Overall, his review of studies in this field indicated a certain minimum baseline IQ as being necessary for effective performance. However, he concludes that intelligence test scores should simply be used as one of several predictors of performance. IQ scores do not constitute comprehensive judgements about a person's capacity, as an outstanding executive is far more than a highly intelligent person.

The search for characteristics, other than IQ, which adequately explain variations in success is by no means new. Thorndike (1920), in reviewing the predictive power of IQ, developed the concept of social intelligence as a means of explaining variations in outcome measures not accounted for by IQ. However, this approach was somewhat stifled by the predominance of the behaviourists in the 1920's and 30's and the subsequent focus on cognitive psychology. The interest in a broader view of intelligence was once again brought to attention by researchers such as Gardner & Hatch (1989) who developed and explored the concept of Multiple Intelligences. The spectrum of intelligences proposed was examined in conjunction with measures of IQ (using the Stanford-Binet Intelligence Scale) and no significant relationships were found (Gardner & Hatch, 1989). This led to a conclusion that the 'other' intelligences proposed were a distinctively different construct to IQ.

In a different type of study, Sternberg (1985) asked people to describe an "intelligent person". The descriptions provided included "practical people skills" among the main attributed traits. Studies such as these re-awakened interest in Thorndike's Social Intelligence construct, which he identified as being distinct from academic abilities (Thorndike, 1920).

In developing explanations of the 'interpersonal intelligences', the major paradigm has been that of meta-cognition (i.e., awareness of one's mental processes) rather than exploration of the full range of emotional abilities (Goleman, 1995). In identifying a range of emotional abilities Goleman highlights a need to go beyond meta-cognition and explore the concept of "metamood" (which he defines as awareness of one's own emotions). He further expands on this to highlight the importance of self-awareness which he describes as being:

"...aware of both our mood and our thoughts about that mood...non-reactive, non-judgemental attention to inner states." (p.43)

In reviewing the development of the concept of EI it is evident from the foregoing summary that one of the major driving forces has been the failure of IQ to account for sufficient variance in success both in an educational and occupational context. This interest is by no means new (e.g., Thorndike, 1920), however the construct has evolved from a meta-cognition paradigm to a broader view of the nature and range of abilities which are labelled as EI. Unfortunately, as yet there have been few empirical studies conducted to investigate the predictive validity of EI, and many of the claims have been anecdotal.

Emotional intelligence and Occupational Success

In recent years organisations have focused on rationality and the development of technical skills in order to enhance competitiveness. This is reflected in higher levels of skills training and in the implementation of forms of work organisation designed to promote knowledge and expertise. Concentrating on the realm of facts and intellect has meant emotions have been undervalued in organisations, as noted by Höpfl & Linstead (1997):

"It is almost certainly a commonplace to observe that organisational emphases on rationality have lead to the relative neglect of emotional issues in organisational life." (p.5)

Although 'emotional' factors such as stress and job satisfaction have been extensively studied in the workplace, these remain fairly general in their application rather than focusing on specific aspects of EI (Briner, 1998). However, work values are shifting. Not only are employees judged on their 'hard skills' of intellect, training and expertise; but also on their 'soft skills' of perceiving and expressing emotions. Accumulating evidence suggests that EI plays a vital role in determining occupational success:

"Emotions, properly managed, can drive trust, loyalty, and commitment – and many of the greatest productivity gains, innovations, and accomplishments of individuals, teams, and organisations." (Cooper, 1997, p.31)

It has been estimated that EI abilities are about twice as important as cognitive abilities for producing effective performance at work; and that 80% of the factors

distinguishing superior from average performers at work depend on EI abilities (Goleman, 1998). EI has been reported to facilitate learning, improve leadership, lead to radical change, increase motivation and build competitive advantage in the workplace (e.g., Fineman, 1997; Höpfl & Linstead, 1997; Huy, 1999; Ostell, Baverstock, & Wright, 1998).

Unfortunately, many of these claims have been anecdotal and there is a need for more systematic, empirical studies to be carried out. Dulewicz & Higgs (1998a) evaluated a competency-based EI measure on data gathered from 100 general managers over a seven-year period. Level of advancement by individuals within the organisation was used as the measure of success. The EI scale accounted for 36% of the total variance in level advancement, whereas intellectual and managerial intelligence accounted for 27% and 16% respectively. These findings support Goleman's (1995) view that a combination of EI and IQ is a more powerful predictor of success than either measure alone.

EI measures have also been found to predict stress levels and general well-being in the workplace. Bar-On et al. (2000), used the EQ-i (described earlier) in police officers and care workers to investigate occupational stress. Police officers scored higher on the EQ-i than care workers, especially in terms of positive affect and emotional stability, implying that they were more adaptable in general, coped better with stress and enjoyed their work. However, this may be due to differences in the occupational culture rather than differences in EI scores. For instance, police officers may enjoy their work more than care workers due to a greater variability of work tasks. Also, although many stressors may be similar between the groups (such as lack of resources, poor communication, job overload), many stressors are likely to be occupation specific which may account for the different levels of coping between the groups. More interesting are the comparisons within various occupational groups. As mentioned earlier, unpublished reports cited in the EQ-i Technical Manual (Bar-On, 1997) suggest that scores on various sub-scales have been used to discriminate between successful employees both in terms of affective well-being and productivity, and that EQ-i scores accounted for 27% of the variance in job performance, whereas cognitive ability accounted for less than 1%. These statements should however be treated with caution given the lack of published research on the EQ-i.

In summary, it appears that organisations stand to gain significant advantages by paying attention to the EI abilities of their workforce. However, research is still in its infancy and there is a need for a more systematic, rigorous evaluation of the influence of EI in the workplace. It is not sufficient to look only at the contribution of EI to overall job performance. Individual aspects of EI may effect various workplace

behaviours in different ways and also may vary across occupations. Such questions can be addressed by conducting longitudinal and comparative studies.

Emotional intelligence and academic achievement

Similar to research on the effect of EI in organisations, there have been few empirical studies which have assessed the contribution of EI to academic performance. Again, many of the proposed claims for the predictive validity of EI abilities have been anecdotal and results have been rather mixed.

As discussed earlier, Schutte et al. (1998) found evidence for the predictive validity of EI in that college students' EI scores significantly predicted their end-of-year grade point average. However, this study did not take account of other possible confounding variables such as cognitive ability and personality.

In contrast, a more recent study conducted with 180 students demonstrated that EI was not related to academic achievement, whereas both cognitive ability and personality were significantly associated with academic performance (Newsome et al., 2000). EI was assessed using the EQ-i, (Bar-On, 1997), which was described earlier in the section on measuring EI. General cognitive ability was assessed using the Wonderlic Personnel Test, and personality was measured by the 16PF. Academic achievement was assessed using student's end-of-year grade point averages collected four months after the administration of the other measures. Academic achievement was found to correlate significantly with the Wonderlic and with the Extraversion and Self-control factors of the 16PF. Specifically, individuals who had higher cognitive ability, who were more introverted, and who had higher self-control, tended to have higher grade point averages. The total EQ-i score and the five EQ-i factors were not associated with grade point average. Although EI did not predict academic achievement in this particular study, it may be due to the limitations of the measure used to assess it. The EQ-i was found to overlap considerably with the 16 PF, especially Neuroticism. Given that there is a wealth of research suggesting no relationship between Neuroticism and academic achievement, it is hardly surprising that the EQ-i does not correlate with cognitive ability either. Researchers should be careful of using measures such as the EQ-i for selection purposes before they have been rigorously tested.

Summary

In summary, the lack of conclusive research regarding the relationship between EI and performance is due in part to a lack of agreement among EI researchers over what constitutes EI and how it should be measured. Researchers need to specify not only which particular aspect of EI is being measured, but also which aspect of

performance is being assessed. Individual components of EI may predict different aspects of academic achievement.

The relationship between EI and performance is a complex one and until further systematic research is conducted, results must be treated with caution. Researchers need to adopt a componential approach considering various aspects of EI in turn and assessing their predictive validity over certain performance skills. Research to date holds great promise for the predictive validity of EI, but successful future research largely depends on the skills of researchers in accurately identifying what they mean by performance.

General summary

This Chapter has outlined a number of complexities surrounding the investigation of EI, which will be controlled for throughout the thesis. Also, it has identified EP as the most important part of EI, arguably the only independent aspect once personality and cognitive ability have been assessed. The status and measurement of the EP concept within the EI framework is addressed in Chapter 2.

Chapter 2

The status and measurement of an emotional perception component within emotional intelligence

Chapter 1 discussed the integration of emotion within the traditional intelligence framework, which lead to the development of the EI concept. It described the rise and popularisation of the topic and evaluated various theoretical accounts of EI. A number of controversies were identified within the research, and it was suggested that the concept of EI may not be as broad as originally claimed by many theorists.

This Chapter further investigates this suggestion by evaluating the status of EP, which has been purported to be the most important aspect of EI once other potential confounds have been assessed (Davies et al., 1998). Additionally, the theoretical areas in which EP may influence are identified, and the development and validation of a scale designed to measure EP is described. Finally, an outline for the rest of the thesis is provided.

Emotional perception as an independent factor of emotional intelligence

The ability to perceive emotion in others has been proposed as an important component of EI (e.g., Davies et al., 1998; Martinez-Pons, 1997; Mayer & Geher, 1996; Salovey & Mayer, 1990), indeed perhaps the only aspect of EI which is truly *emotional*, in that it is not simply a manifestation of personality or cognitive ability.

Although speculative at this stage, there are a number of theoretical areas in which EP may have an important contribution to make. First, as part of the EI framework, EP may influence performance and have longitudinal effects. EI has been heralded as a predictor of successful performance both in terms of academic and occupational success (discussed in Chapter 1), so it seems reasonable to hypothesise that EP will demonstrate predictive validity over performance.

The second area which EP may have theoretical influence is in social settings. EP involves the ability to perceive emotion in others which clearly has implications in the social environment. Presumably, people who are good at perceiving emotions in others will know how to react appropriately in social settings and may consequently develop more successful personal interactions. Assessing emotions in other people is linked to

self-perception of how we portray our own feelings, thus EP is likely to be related to a range of social emotions, particularly self-conscious emotions such as embarrassment, shame, guilt and pride.

The third area in which EP may have theoretical influence is actual moment-by-moment regulation of behaviour. In general, EI research has been criticised for relying purely on self-report measures, and it has been suggested (Petrides & Furnham, 2000) that more objective methods and experimental methodologies should be used to investigate the construct. Most emotion research has used attention to look at the detailed effects of behaviour (see Chapter 7 for a discussion). As EP involves scanning the emotional landscape, it is possible that attention towards emotionally meaningful stimuli may be mediated by EP.

Although potentially important, EP has proved very difficult to measure. Self-report measures relying on people's self-descriptions may be inaccurate, whereas responses to tests directly measuring the ability have resulted in weak internal consistency coefficients. For instance, Davies et al. (1998) employed a number of direct, objective measures of EP. In these measures, originating in the work of Mayer, DiPaulo, & Salovey (1990), participants were presented with 12 facial images, 12 colours, 12 excerpts of music, and 12 voice intervals. For each stimulus, participants were provided with a list of six different emotions: happiness, sadness, anger, fear, surprise, and disgust; and were asked to judge which of the six was present in a given stimulus. The tests were scored using both target scoring methods (the person experiencing the emotion, as given by Ekman & Friesen (1975), and consensual scoring methods (the participant responded within one point of the sample's modal response). The only test which had satisfactory internal reliability was the Faces Test, in particular when scored using the target method. Scores for the Colours, Music and Voices tests, when based on consensual scoring, were low on internal reliability. Relying purely on "objective" measures does not therefore permit EP to be assessed in a dependable way.

This thesis focuses on EP as a potentially independent factor, arguably the most important aspect, of EI. The first problem to overcome (assessed in Study 1 of this Chapter) was whether EP could be measured effectively. Subsequent chapters look specifically at what EP is and how useful it may be. For example, is EP independent from cognitive ability and personality variables? Is it related to other theoretically relevant variables, such as other components of EI? Does EP evidence predictive validity? Given the problems associated with relying purely on self-report data, does EP have actual behavioural effects?

Study 1

Development of the Questionnaire

A self-report measure of EP was chosen for a number of reasons. First, as noted above, typical internal consistency coefficients for objective measures of EP are lower than those produced by self-report instruments. Second, self-report measures are easier to administer, particularly in applied settings where measures of EP may be included among other measures of both emotional and cognitive ability. Although self-report measures can be inaccurate, the scale will be correlated with objective measures and actual behaviour in order to address this problem.

Items for the scale were adapted from the Affective Communication Test (ACT, Friedman, Prince, Riggio, & DiMatteo, 1980), a validated 13-item instrument measuring nonverbal emotional expressiveness in a variety of situations (see Table 2.1). Emotional expression involves the signalling of emotion through various different channels (facial expression, body posture and the form and content of the voice). Similarly, we perceive the emotions of others by paying attention to cues from these same channels, and emotional communication and perception are conceptually if not behaviourally related. It was therefore decided that the ACT offered a sound basis for the development of a measure of EP. Items for the scale were created by changing the focus of ACT items from expression of emotion to EP. For example, the ACT item "I can easily express emotion over the telephone" became "I am good at recognising emotions when they are expressed over the telephone" in the EP scale. In addition, new items were created for the scale in order to cover other aspects of EP. For instance, expression through vocal channels was not incorporated within the ACT to any great extent so new items designed to tap this aspect were created for the EP scale.

Table 2.1 The 13-item Affective Communication Test.

1. When I hear good dance music, I can hardly keep still
2. My laugh is soft and subdued
3. I can easily express emotion over the telephone
4. I often touch friends during conversations
5. I dislike being watched by a large group of people
6. I usually have a neutral facial expression
7. People tell me that I would make a good actor or actress
8. I like to remain unnoticed in a crowd
9. I am shy among strangers
10. I am able to give a seductive glance if I want to
11. I am terrible at pantomime as in games like charades
12. At small parties I am the centre of attention
13. I show that I like someone by hugging or touching that person

Initially, 17 items were selected for the questionnaire (see Table 2.2). Respondents used a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7). A 7-point scale was chosen as it has been suggested (e.g., Kline, 1993), that individuals are less likely to respond at the extremes than with a 5-point scale.

Table 2.2 The 17-item emotional perception scale.

1. I can tell when other people are affected by emotionally charged music
2. I can see when a friend is angry with me just by looking at them
3. I recognise enthusiastic laughter in other people, regardless of whether I respond to it or not
4. I am good at recognising emotions when they are expressed over the telephone
5. I know which of my friends are more or less likely than me to initiate physical contact during conversations
6. I am very aware of when other people are feeling nervous or embarrassed in public
7. I can tell a lot about what a person is experiencing by looking at their facial expression
8. I know which of my friends would make good actors or actresses
9. I am able to tell whether someone is anxious or not just by observing their body language
10. I can recognise people who are shy amongst strangers
11. I know when someone is trying to seduce me
12. I find it easy to recognise what feelings people are portraying in games like charades
13. In any social situation, I know who wants to be the centre of attention
14. Just by listening to someone's voice on a radio talk show, I can tell whether they are angry or not
15. I recognise immediately when someone wants to express intimacy to a greater or lesser degree than I am comfortable with
16. When someone smiles at me, I can tell whether it is false or if it is really meant
17. I find it difficult to tell how someone is feeling just by looking at them

It is hypothesised that the short self-report scale designed to assess EP would result in an acceptable degree of score reliability, internal consistency and test-retest reliability, and would not correlate with the ACT from which it was developed (evidencing discriminant validity). Furthermore, it was predicted that women would report superior levels of EP (higher scores) on the scale, in line with previous research on sex differences in the perception and expression of emotion (e.g., Ciarrochi et al., 2000; Mayer & Geher, 1996). Finally, it was predicted that scores on the scale would correlate with an objective measure similar to ones traditionally used to assess EP.

Methods

Participants

A total of 100 first-year undergraduate Psychology students (59 female and 41 male) participated in the study. The sample ranged from 18 to 43 years of age (M = 23.70, SD = 5.44). Participation in the study was voluntary.

Materials

Participants completed the EP scale, the ACT and one "objective" measure of EP: A Facial and Posture Perception Test. In order to help establish the validity of the EP scale, it was considered necessary to examine its relationship with existing nonverbal measures of EP.

The Facial and Posture Perception Test consisted of two similar sub-tests. The first was based on stimuli reproduced from the Pictures of Facial Affect (Ekman & Friesen, 1975). 12 pictures were chosen from the original set of 110 (six male and six female), to represent the six emotions (anger, disgust, fear, happiness, sadness and surprise). References to exact images were as follows: happiness (NR1-6 & WF2-11), sadness (EM4-24 & MO1-30), anger (WF3-1 & C2-12), surprise (NR1-14 & GS1-16), fear (PF2-30 & JJ5-13), and disgust (JB1-16 & C1-4).

The second aspect measuring EP concerned recognition of five of the six basic emotions from body postures. In a similar format to the Pictures of Facial Affect, ten images, showing the postures for anger, fear, happiness, sadness and surprise from the

front and side were presented to participants in a forced-choice response format[1]. A full list of materials can be found in Appendix B.1.

Procedure

The measures were administered to groups of between 20-25 participants over a 10-15 minute session.

Results

Summary Statistics

Descriptive statistics and alpha reliabilities calculated for the EP scale, ACT and Facial and Posture Perception Test are presented in Table 2.3. The summary statistics calculated for the ACT were similar to those obtained in the past (e.g., Davies et al., 1998; Friedman et al., 1980). The summary statistics calculated for the EP scale showed a normal distribution with a variance approximately equal to that of the ACT. The two aspects of nonverbal EP (recognition from facial expressions and body postures) were combined as a single measure in order to increase the alpha reliability of the Facial and Posture Perception Test to 0.75.

Table 2.3 Descriptive Statistics for the emotional perception scale, the Affective Communication Test, and the Facial and Posture Perception Test.

Measure	M (SD)	Range	Cronbach's alpha
EP scale	88.71 (13.82)	69.00	0.82
ACT	47.92 (9.10)	43.00	0.80
Facial & Posture Test	17.34 (2.85)	11.00	0.75

Reliability and Factor analysis of the emotional perception scale

Factor analysis using the method of principal components (PCA) was conducted on the responses of the 100 participants to the 17-item EP scale. The criterion of salient loading was 0.30. The first five factors extracted in the initial solution had eigenvalues of 5.55, 1.83, 1.25, 1.20 and 1.01, together accounting for 63% of the variance.

[1] Although a posture for disgust has been developed and tested, and is discussed elsewhere (Coulson, in press), recognition rates for the disgust posture are barely above chance, and this emotion was not included in the test.

Examination of the scree plot (see Appendix A.1) derived from the PCA showed a pronounced dip between the first and second components, indicating that a single component provided an appropriate solution for the scale. The component pattern matrix corresponding to this solution is presented in Table 2.4. This component, labelled EP, accounted for 33% of the variance and had loadings from 0.48 to 0.69.

Table 2.4 Loadings for One-Component Solution for the emotional perception scale.

Item	Component emotional perception
03. I recognise enthusiastic laughter in other people, regardless of whether I respond to it or not	.69
06. I am very aware of when other people are feeling nervous or embarrassed in public	.68
16. When someone smiles at me, I can tell whether it is false or if it is really meant	.68
11. I know when someone is trying to seduce me	.67
15. I recognise immediately when someone wants to express intimacy to a greater or lesser degree than I am comfortable with	.67
13. In any social situation, I know who wants to be the centre of attention	.63
09. I am able to tell whether someone is anxious or not just by observing their body language	.61
14. Just by listening to someone's voice on a radio talk show, I can tell whether they are angry or not	.57
05. I know which of my friends are more or less likely than me to initiate physical contact during conversations	.57
04. I am good at recognising emotions when they are expressed over the telephone	.57
02. I can see when a friend is angry with me just by looking at them	.56
10. I can recognise people who are shy amongst strangers	.54
08. I know which of my friends would make good actors or actresses	.49
12. I find it easy to recognise what feelings people are portraying in games like charades	.58
17. I find it difficult to tell how someone is feeling just by looking at them (-)	
01. I can tell when other people are affected by emotionally charged music	
07. I can tell a lot about what a person is experiencing by looking at their facial expression	.48

The internal consistency reliability of the scores for the 17-item scale was 0.81. Following two cycles, two items were excluded resulting in a final alpha level of 0.82. The 15-item EP scale is presented in Table 2.5.

Table 2.5 The final 15-item emotional perception scale.

1. I can see when a friend is angry with me just by looking at them
2. I recognise enthusiastic laughter in other people, regardless of whether I respond to it or not
3. I am good at recognising emotions when they are expressed over the telephone
4. I know which of my friends are more or less likely than me to initiate physical contact during conversations
5. I am very aware of when other people are feeling nervous or embarrassed in public
6. I can tell a lot about what a person is experiencing by looking at their facial expression
7. I know which of my friends would make good actors or actresses
8. I am able to tell whether someone is anxious or not just by observing their body language
9. I can recognise people who are shy amongst strangers
10. I know when someone is trying to seduce me
11. I find it easy to recognise what feelings people are portraying in games like charades
12. In any social situation, I know who wants to be the centre of attention
13. Just by listening to someone's voice on a radio talk show, I can tell whether they are angry or not
14. I recognise immediately when someone wants to express intimacy to a greater or lesser degree than I am comfortable with
15. When someone smiles at me, I can tell whether it is false or if it is really meant

Correlation with the Affective Communication Test

As predicted, scores on the scale were not significantly correlated with scores on the ACT ($r = 0.17$, n.s).

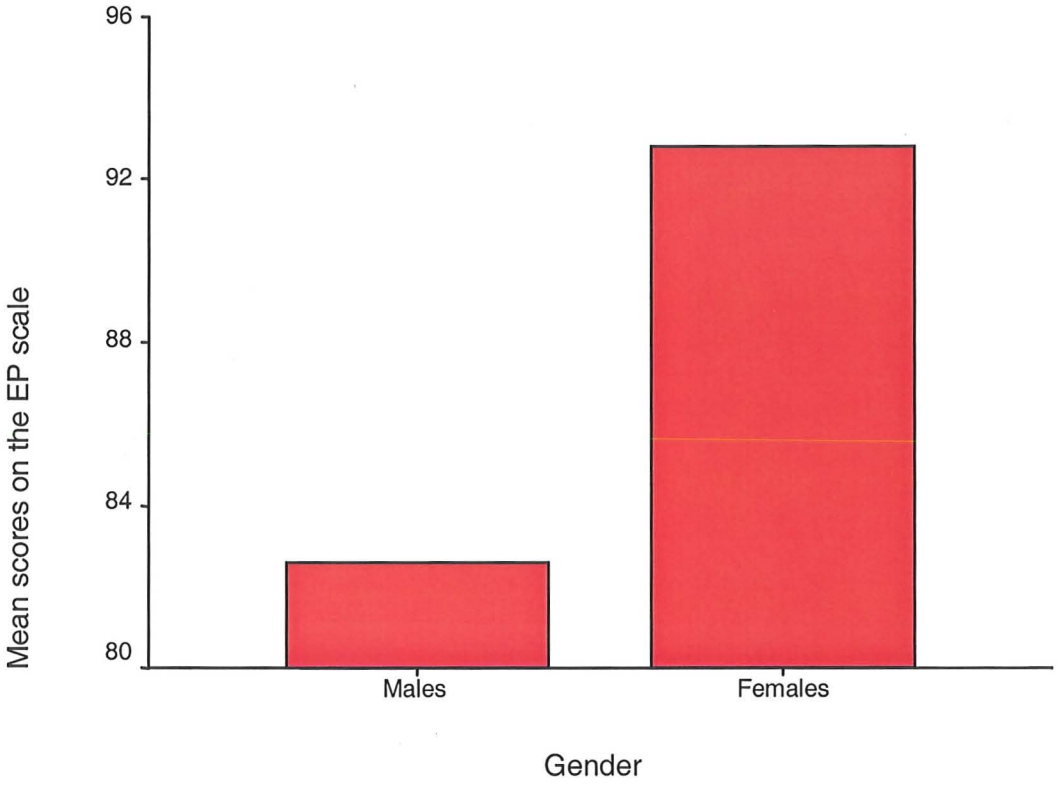
Correlation with an objective measure of emotional perception

As predicted, scores on the scale were significantly correlated with scores on a Facial and Posture Perception Test ($r = 0.57$, $p < 0.05$). Scores on the ACT were not correlated with this test ($r = 0.15$, n.s).

Sex Differences

Women scored significantly higher on the scale than men, $t(98) = 3.90$, $p < 0.05$ ($M=92.85$; $SD=11.92$ and $M= 82.61$; $SD=14.15$, respectively), represented in Fig 2.1. There was no sex difference for the ACT, $t(98) = 1.0$, n.s.

Fig 2.1 Sex differences for scores on the emotional perception scale.



Test - retest reliability

In order to assess the test-retest reliabilities, 19 of the respondents who originally completed the measures were contacted eight weeks later to complete the EP scale and the ACT again. Eight-week test-retest reliabilities, calculated using Pearson's product moment correlation, were 0.76 ($p < 0.05$) for the EP scale, and 0.81 ($p < 0.05$) for the ACT. Guttman split-half reliabilities for the EP scale and ACT were 0.86 and 0.89 respectively.

Discussion

The aim of Study 1 was to develop and assess a short self-report measure of EP. Reliability coefficients estimated from this sample indicate that the 15-item scale may reliably assess EP.

In terms of construct validity, results of the Principal Components Analysis (PCA) suggest that the scale has a one-component structure accounting for 33% of the total variance. The items of the scale reflect two main aspects of EP: The ability to perceive

intentions in others (e.g., "When someone smiles at me, I can tell whether it is false or if it is really meant") and the ability to understand emotions in others (e.g., "I am very aware of when other people are feeling nervous or embarrassed in public.") It was decided that the EP scale would be called the Affective Perception Test (APT) to mirror the ACT from which it was developed.

Further evidence of construct validity was demonstrated by the correlation between the APT and an objective measure of EP: A Facial and Posture Perception Test. Even though alpha reliabilities are often lower than those produced by self-report instruments, objective measures (particularly facial expressions), have been traditionally used to assess EP (e.g., Baum & Nowicki, 1998; Ekman, 1993; Hall, Gaul, & Kent, 1999; Mayer et al., 1990). The fact that the APT is related to such a test indicates that it has a sound theoretical basis, accurately assessing what it purports to measure, not purely relying on correlations with other self-report measures.

The measure showed evidence of discriminant validity as scores on the APT were not significantly related to scores on the ACT. Further validity evidence was demonstrated by the fact that women scored significantly higher than men on the APT, a finding to be expected in light of previous research on sex differences in the perception and expression of emotion (e.g., Ciarrochi et al., 2000; Mayer & Geher, 1996). The fact that women did not score any higher than men on the ACT is in contrast with research showing greater expressiveness for females (e.g., Friedman et al., 1980).

It is noted that of the initial 17 items selected for the APT, only one was negatively worded. However, the potential for an acquiescence bias of scores is not likely to occur in this case. Such bias is more likely to influence dichotomous judgements than rating scales and furthermore, negative items have been reported to impair response accuracy and reliability (Schriesheim & Hill, 1981, cited in King & Emmons, 1990).

Outline of the thesis

Prior to investigating the potential contributions of EP, it was first necessary to develop and validate a measure of the construct. The results of Study 1 suggest that the APT may reliably assess the component of EP.

Three main theoretical areas where EP may have an influence were outlined at the start of the Chapter. Each of these are considered in the thesis, which is constructed of three parts. The first part concerns the role of EP in performance and considers whether it has longitudinal effects. In order to examine these issues, first it has to be established

that the construct is independent from potential confounds (such as personality and cognitive ability). Chapter 3 describes the construction of a test battery for two longitudinal studies. Chapter 4 compares the APT with scales measuring other components of EI, a personality inventory, a measure of verbal IQ, a well-being scale and a coping scale in order to assess the reliability and validity of the measures, and to examine the correlations between them. Chapter 5 considers the relationship between the APT and various different aspects of academic achievement in order to assess the predictive validity of EP. It also considers changes over time in EP which may occur.

Part two of this thesis concerns the role of EP in social settings. The self-conscious emotion of embarrassment is used as a tool for investigating these effects. Chapter 6 considers the influence of EP in the social environment when delivering class presentations.

Part three uses the attentional bias framework in order to consider the behavioural effects of EP. Chapter 7 reviews the research on attentional biases for threat, which is used as a framework in order to investigate the effects of EP on behaviour. Chapters 8 and 9 describe a series of four studies which consider the role of EP in actual moment-by-moment regulation of behaviour.

Chapter 3

Construction of a test battery for two longitudinal studies

To determine whether EP represents an independent ability, the concept needs to be measured effectively and it needs to be demonstrated that it has at least some independent status over and above cognitive ability and personality. Its relationship with other theoretically relevant variables, and whether it evidences predictive validity also need to be explored in order to generate further validity evidence.

This part of the thesis considers whether EP influences performance and has longitudinal effects. In order to do this, we first need to construct a reliable set of measures to administer. This Chapter describes a selection of measures to be employed in two longitudinal studies (described in Chapters 4 and 5). It is acknowledged that this analysis draws heavily upon the Davies et al. (1998) article, where much of the groundwork has been covered, and the Trait Meta Mood Scale (Salovey, Mayer, Goldman, Turvey, & Palfai, 1995), one of the more established measures of EI.

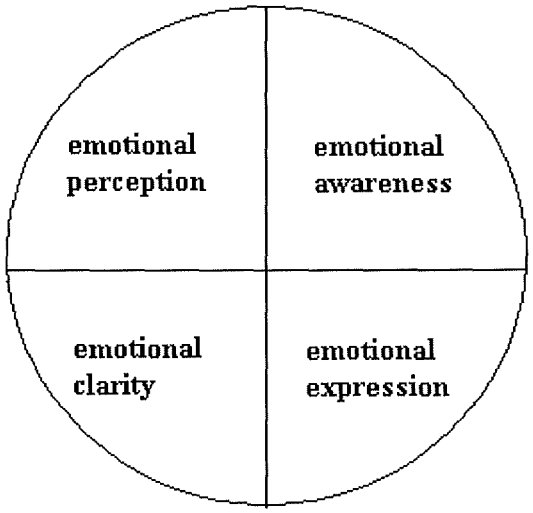
A useful theoretical classification taking account of the different measurement approaches and operational definitions adopted by researchers is that between *trait* EI and *information processing* EI (Petrides & Furnham, 2000). Trait EI is embedded within the personality framework and is assessed via self-report instruments that purport to measure typical behaviour (e.g., Bar-On, 1997; Salovey et al., 1995; Schutte et al., 1998). This approach to EI draws heavily on personality variables such as extraversion, agreeableness and optimism, but often includes many, somewhat vaguer, constructs that seem to be potential correlates (e.g., motivation, resilience, happiness and decisiveness) rather than essential components of EI. By contrast, the information processing approach is more closely related to traditional measures of cognitive ability and is more explicit to the underlying components of EI (e.g., Mayer et al., 1999). This approach is generally more "objective" concerned with identifying actual performance abilities (e.g., ability to perceive, express and label emotions). Lost in the explosion of interest in the EI topic is the fact that many of the measures may not be reliable or valid (Davies et al., 1998).

Although primarily interested in EP, at this stage an inclusive approach is adopted so other aspects of EI are included in the test battery. From conducting a review of the available literature and paying particular reference to the article by Davies et al. (1998), the components of EI assessed by the longitudinal studies were: EP, emotional awareness, emotional clarity, and emotional expression (see Fig 3.1). It

is acknowledged that Davies et al. (1998) classify emotional expression under the component of emotional awareness (i.e. the degree to which people think about and express their feelings), but other researchers (e.g., Ekman, 1993; Friedman et al., 1980; King, 1998; King & Emmons, 1990; Mayer & Geher, 1996) have demonstrated that emotional expression is significant in the communication and socialisation of emotion. From a theoretical perspective, it therefore appears that this aspect could be considered as a separate component of EI.

Chapter 3 considers each of these four components in turn and provides a justification for the particular measures proposed. Chosen measures for cognitive ability, personality, well-being and coping are also justified. A summary of all the potential EI tests examined are presented in Table 3.1.

Fig 3.1 The theoretical model of emotional intelligence for the longitudinal studies.



Emotional perception

EP is an important component of EI which has proved difficult to measure (as discussed in Chapter 2). From the results of Study 1, it appears that the APT offers the potential to measure this challenging component. The APT will be employed as the measure of EP in the longitudinal studies in order to obtain further reliability and validity evidence for the scale.

Emotional awareness

This refers to the degree to which individuals are aware of and think about their feelings (e.g., Davies et al., 1998; Salovey & Mayer, 1990). The Attention sub-scale of the Trait Meta-Mood Scale (TMMS, Salovey et al, 1995) purportedly measures the degree to which individuals notice and are aware of their feelings. There are 13 items, e.g., "I pay a lot of attention to how I feel" and "The best way for me to handle my feelings is to experience them to the fullest" rated on a 5-point scale ranging from strongly disagree (1) to strongly agree (5). It was originally found to offer an internal consistency reliability of 0.86 (Salovey et al., 1995) and subsequent studies using the Clarity sub-scale have reported score reliabilities of internal consistency of 0.65 (Martinez-Pons, 1997) and 0.82 (Davies et al., 1998). It also it had the highest loading (0.71) on the emotional awareness factor (Davies et al., 1998).

The construct validity of the sub-scale, established by Salovey et al. (1995) was supported by Martinez-Pons (1997; 1998) who conducted path analysis on the TMMS. A significant correlation was found between attention and clarity (0.26) and between clarity and repair (0.47), but a non-significant correlation emerged between attention and repair (0.12) when the mediating effect of clarity was statistically controlled. These findings are in line with the requirements for assessing construct validity which state that there should be statistically significant correlations between adjacent components of a model, and lower or non-significant correlations between non-adjacent components (Guttman, 1953, cited in Martinez-Pons, 1997; 1998).

In reference to the relationship of this sub-scale with other concepts, Davies et al. (1998) found that the Attention sub-scale loaded highly (0.65) on Agreeableness of the NEO Personality Inventory, but was not significantly related to most cognitive ability measures. It had a weak link with verbal ability (0.27 loading on this factor). Martinez-Pons (1997; 1998) found that the TMMS showed predictive validity in relation to other key aspects of personal functioning. It had a positive relationship with goal orientation and life satisfaction and a negative relationship with symptoms of depression.

Another scale purporting to measure emotional awareness was the Externally Oriented Thinking sub-scale of the Toronto Alexthimia Scale (Bagby, Parker, & Taylor, 1994a; 1994b). This measures the ability to pay attention to one's own emotions and therefore had a negative loading (-0.54) on the emotional awareness factor (Davies et al., 1998). However, a reliability analysis showed that the scale was unreliable with an internal consistency of only 0.07 (Davies et al., 1998). Reliability was one important criteria taken into account when assessing measurement scales, and this sub-scale was therefore excluded from further consideration.

Taking into account the relative advantages and disadvantages of each possible measure for this component of EI, it was concluded that the Attention sub-scale of the TMMS was the most suitable measure for emotional awareness.

Emotional clarity

This refers to the extent to which individuals understand and identify their own emotional state (e.g., Davies et al., 1998; Salovey & Mayer, 1990). The Clarity sub-scale of the TMMS (Salovey et al., 1995) purportedly measures the ability to understand and discriminate among one's own emotions. There are 11 items, e.g., "I almost always know exactly how I am feeling" and "I am usually very clear about my feelings" rated on a 5-point scale ranging from strongly disagree (1) to strongly agree (5). It was originally found to offer an internal consistency reliability of 0.88 (Salovey et al., 1995), and subsequent studies using the Clarity sub-scale have reported score reliabilities of internal consistency of 0.73 (Martinez-Pons, 1997) and 0.83 (Davies et al., 1998). It also had the highest loading (0.82) on the factor which (Davies et al., 1998) labelled as Emotional Clarity.

As with the Attention sub-scale of the TMMS, the construct validity was once again supported by path analysis (Martinez-Pons, 1997; 1998).

With reference to the relationship of the Clarity sub-scale with other concepts, Davies et al. (1998) found that it had a reasonably high negative loading (-0.55) on Neuroticism of the NEO Personality Inventory, and also loaded reasonably highly on a measure of verbal ability (0.45 loading on this factor). As noted above, Martinez-Pons (1997; 1998) found that the TMMS demonstrated predictive validity in relation to other key aspects of personal functioning.

Another scale purportedly measuring emotional clarity was the Difficulty Describing Feelings sub-scale (Bagby et al., 1994a; 1994b). It claims to measure the ability to understand one's emotions, and therefore had a negative loading (-0.41) on the emotional clarity factor (Davies et al., 1998). However, a reliability analysis found this scale to offer an internal consistency of merely 0.36, and it was consequently deemed as being unreliable.

To summarise, following an evaluation of the various different scales, it was decided that the Clarity sub-scale of the TMMS represented the best measure for emotional clarity.

Emotional expression

As discussed earlier, although this component has sometimes been classified under emotional awareness, from a theoretical viewpoint, it appears that emotional expression should be treated as an individual component of EI.

The Emotional Expressiveness Questionnaire (EEQ, King & Emmons, 1990) purports to focus on actual expressive behaviours with items tapping the expression of both positive and negative emotions. There are 16 items, e.g., "Watching television or reading a book can make me laugh out loud", "If a friend surprised me with a gift, I wouldn't know how to react" rated on a 7-point scale ranging from strongly disagree (1) to strongly agree (7). High scores on the scale indicate a tendency to express emotion. Initially, the EEQ was constructed from 50 items, but items were deleted as they were judged to tap positive self-assertion rather than emotional expression. It was found to have an alpha reliability of 0.78 and Principle Components factor analysis conducted on the scale extracted three factors: expression of positive emotion (7 items accounting for 14% of the variance), expression of intimacy (5 items accounting for 12% of the variance) and expression of negative emotion (4 items accounting for 10% of the variance). A subsequent reliability analysis showed that these factors have alpha reliabilities of 0.74, 0.67 and 0.63 respectively. Women scored significantly higher on emotional expressiveness than men, a finding to be expected in light of previous research on sex differences in the expression of emotion. Also, the EEQ negatively correlated with ambivalence ($r = -0.24$, $p < 0.01$) suggesting that individuals who are ambivalent about expression tend to be less expressive (King & Emmons, 1990).

The Affective Communication Test (ACT, Friedman et al., 1980), has traditionally been the most widely used measure of expressiveness, but has been criticised for its tendency to tap charisma more than general expressiveness (King & Emmons, 1990). Also Friedman et al. (1980) found an overlap (0.52 correlation) between the ACT and the personality component of Extraversion. Davies et al. (1998) also found the ACT to have a high loading (0.71) on Extraversion. Given these weaknesses, it was decided that the EEQ should be used as an alternative measure of emotional expressiveness, even though it has not yet been widely applied in research.

Personality

Important personality factors that components of EI may overlap with appear to be Neuroticism, Extraversion and Agreeableness (Davies et al., 1998), all of which are

assessed by the NEO-FFI . This 60-item scale was developed as a short version of the Revised NEO Personality Inventory (NEO-PI-R) and is useful where global information on personality is sufficient. Score reliabilities for Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness, were 0.86, 0.77, 0.73, 0.68 and 0.81 respectively (Costa & McCrae, 1992). Respondents were required to answer each statement using a 5-point scale ranging from 0 (strongly disagree) to 4 (strongly agree). Considering the number of measures to be employed in the longitudinal studies, the shortened version of the personality inventory would appear to be the most suitable to reduce participant fatigue. Although considered, the Eysenck Personality Questionnaire does not measure Agreeableness and was therefore not used in the longitudinal studies. It was decided that it would be more consistent to use one personality questionnaire (the NEO-PI-R) rather than sections of various questionnaires for each different personality component.

Cognitive ability

EI has been defined as being a type of *ability* within the *information-processing* approach (e.g., Mayer et al., 1999) and might therefore be expected to share a moderate correlation with other cognitive ability factors. However, measures of EI should also retain some independence over traditional measures of cognitive ability.

The linkage between cognitive abilities and EI is weak and verbal IQ represents the only form of cognitive ability which is potentially overlapping with EI (e.g., Ciarrochi et al., 2000; Davies et al., 1998). As EI appears to be about understanding emotions in self and others, verbal IQ may represent an essential part of this process (as discussed in Chapter 1).

Verbal IQ is assessed using the AH4 Group Test of General Intelligence (Heim, 1970), which is primarily a test of deductive reasoning. The first section deals with an individual's ability to solve verbal and numerical problems and the second section with diagrammatic problems. The test offers an overall score reliability of 0.81 and a test-retest consistency of 0.92. For the longitudinal studies, only questions from the first section involving verbal problems will be employed. Items were selected in order to produce equivalent versions of the test for phases 1 and 2 of the studies. The test was chosen as it is robust and has been widely applied in research, has sufficient items to create equivalent versions and is relatively quick to administer.

Well-being

Both theory and previous research suggests a link between EI and emotional well-being (as discussed in Chapter 1), so its inclusion in the longitudinal studies is of theoretical relevance.

Warr (1990) developed a 12-item measure of well-being covering two axes of anxiety-contentment and depression-enthusiasm. This measure has the advantage of being widely used and well validated, plus it has been shown to be related to aspects of EI (specifically attention and clarity of the TMMS, Salovey et al., 1995). A large number of measures of job-related affective well-being have been developed. These cover specific areas of satisfaction, job attachment, depression, burnout and job morale. There are also a number of context-free measures available to tap life satisfaction, happiness, positive affect, negative affect, anxiety, self-esteem and other types of feeling.

Although research into these aspects of well-being has been valuable and productive, the advantage of Warr's measure is that it also draws upon research from the structure of emotions and moods, which fits well with the overall test battery. The measure is therefore based upon dimensions of pleasure and arousal in addition to competence, aspiration and negative job carry-over.

The scale was validated on a large sample of 1686 job-holders and it seems to be psychometrically acceptable, and associated with demographic and occupational features in expected ways.

The first axis, anxiety-contentment, is measured through the adjectives tense, uneasy, worried, calm, contented and relaxed. Responses to the first three items are reverse-scored, so that high scores indicate positive well-being. The reported alpha reliability score for the scale was 0.76 (Warr, 1990).

The second axis, depression-enthusiasm, is tapped by depressed, gloomy, miserable, cheerful, enthusiastic, optimistic. The first three items are again reverse-scored and the alpha reliability score was reported to be 0.80 (Warr, 1990).

In the longitudinal studies, items were responded to on a 6-point scale where responses were: never, occasionally, some of the time, much of the time, most of the time, all of the time: and answers were scored from 1 to 6 respectively. Items covering the two axes were intermingled in the questionnaire.

To summarise, of all the measures proposed to assess well-being, Warr's measure seems to be the most suitable in relation to the other measures employed and has been used previously within the EI framework.

Coping

In recent years, research into coping with stress has gained considerable momentum. However, although numerous measures have been proposed, methods used to evaluate the validity of these measures have often been incomplete. Many studies have failed to directly verify the presumed underlying measurement model resulting in ambiguous data regarding construct validity.

The inclusion of a coping scale in the longitudinal studies is of theoretical relevance. Coping variables have been proposed to relate to aspects of EI, particularly emotional expression (e.g., Ciarrochi, Deane, & Anderson, 2002; Stanton, Kirk, Cameron, & Danoff-Burg, 2000)

The 20-item Cybernetic Coping Scale (CSS, Edwards & Baglioni, 1993) has been used extensively to measure coping and was derived from Edwards' cybernetic theory of stress, coping, and well-being. Coping is conceptualised as attempts to reduce or eliminate the negative effects of stress on well-being. Five forms of coping are identified, including attempts to bring the situation into conjunction with desires (i.e., changing the situation), adjust desires to meet the situation (i.e., accommodation), reduce the importance associated with the discrepancy (i.e., devaluation), improve well-being directly (i.e., symptom reduction) and direct attention away from the situation (i.e., avoidance). Hence stress and coping are viewed as critical components of a negative feedback loop, in which stress damages well-being and activates coping, which may improve well-being directly and indirectly.

The first version of the CCS was based on items drawn from existing coping measures, which were substantially revised and supplemented in accordance with the five dimensions indicated by the cybernetic theory. The scale was administered to samples of MBA students, executives, and psychiatric inpatients. The eight items that best reflected each dimension, based on both statistical and conceptual criteria, were retained. Subsequent research, however, showed high overlap between certain items and redundancy in items comprising two of the scales. By dropping the flawed items and retaining the four best items from the scale, a 20-item CCS was formed, which seems to provide a parsimonious representation of the coping dimensions with little loss of information over the full 40-item CCS.

Alpha reliabilities for all scales were 0.79 or higher and confirmatory factor analysis of the associated measurement model indicated a better fit than for the full 40-item CCS (values for fit indices ranged from 0.796 for the AGFI to 0.957 for the NF12).

The 20-item version of the CCS was measured on a 5-point scale, where 1 = "do not use at all", 2 = " use seldomly", 3 = "use sometimes", 4 = "use frequently" and 5 =

"use very much". Items covering all five scales were intermingled in the questionnaire. Higher scores indicate more evidence of coping strategies being employed.

Another scale considered was the Ways of Coping Checklist (WCCL, Lazarus & Folkman, 1984, cited in Edwards & Baglioni, 1993), which is based on Lazarus' transactional model of stress and coping. Coping is defined as the:

"constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taking or exceeding the resources of the person" (Lazarus & Folkman, 1984, p.141).

The 67-item WCCL consists of two basic categories of coping, including efforts to alter the troubled person-environment relationship (i.e., problem-focused coping) and efforts to regulate emotional distress (i.e., emotion-focused coping). These two broad scales were collapsed into eight smaller scales with reliabilities ranging from 0.50 to 0.89, with approximately half exceeding 0.70. Subsequent research has shown the WCCL to have reliability scores between 0.53 and 0.68 with one scale less than 0.40 (Edwards & Baglioni, 1993). The factor structure of the WCCL is also unstable, yielding anywhere from three to eight factors and loadings vary considerably, such that items are assigned to different factors or dropped entirely from one analysis to another.

Taking account of the criticisms of the WCCL and coping scales in general, it was decided that the CCS was the best measure for the longitudinal studies.

Table 3.1 Summary of all the emotional intelligence tests examined with their corresponding score reliabilities from various different studies, their major strengths and weaknesses.

Test	component of EI	alpha reliability	strengths	weaknesses
Affective Perception Test	EP (self-report)	0.82 (Study 1).	A decent self report measure of EP does not yet exist. Developed from reliable evidence on the research of emotional expression. Initial work demonstrates reliability and validity evidence.	Further research needs to be conducted.
Faces, Colours, Music and Sounds (Davies et al., 1998)	EP (objective)	Faces, Colours, Music and Sounds 0.71, 0.28, 0.37, 0.31 respectively.	Directly measure the construct. Faces test good reliability.	Suffers from poor reliability.
Attention sub-scale (Salovey et al., 1995)	Emotional awareness	0.86 (Salovey et al., 1995). 0.82 (Davies et al., 1998). 0.65 (Martinez-Pons, 1997).	Highest loading (0.71) on the emotional awareness factor (Davies et al., 1998). Evidence of construct validity (Martinez-Pons, 1997; Salovey et al., 1995). Not significantly related to most cognitive ability measures (Davies et al., 1998). Predictive validity (Martinez-Pons, 1997; 1998).	May be related to Agreeableness (Davies et al., 1998).

Externally Oriented Thinking sub-scale (Bagby et al., 1994a; 1994b)	Emotional awareness	0.07 (Davies et al., 1998).	Negative loading (-0.54) on the emotional awareness factor (Davies et al., 1998) = validity evidence.	Significantly unreliable.
Clarity sub-scale (Salovey et al., 1995)	Emotional clarity	0.88 (Salovey et al., 1995). 0.83 (Davies et al., 1998). 0.73 (Martinez-Pons, 1997).	High loading (0.82) on clarity factor (Davies et al., 1998). Construct validity (Martinez-Pons, 1997; Salovey et al., 1995). Predictive validity (Martinez-Pons, 1997; 1998).	May be related to Neuroticism and verbal ability (Davies et al., 1998).
Difficulty Describing Feelings sub-scale (Bagby et al., 1994a; 1994b)	Emotional clarity	0.36 (Davies et al., 1998).	Negative loading (-0.41) on the emotional clarity factor (Davies et al., 1998) = validity evidence.	Significantly unreliable.
Emotional Expressiveness Questionnaire (King & Emmons, 1990)	Emotional expression	0.78 (King & Emmons, 1990).	Focuses on actual expressive behaviours. Taps the expression of both positive and negative emotions. Predictive validity (King & Emmons, 1990).	Not widely applied in the research.
Affective Communication Test (Friedman et al., 1980)	Emotional expression	0.77 (Friedman et al., 1980).	Convergent and discriminant validity. Predictive validity (Friedman et al., 1980).	Tends to tap charisma more than general expressiveness. High loading (0.71) on Extraversion (Davies et al., 1998). 0.52 correlation with Extraversion (Friedman et al., 1980).

Piloting the test battery

Prior to administering the test battery to participants for the longitudinal studies, a pilot study was conducted with 25 Psychology undergraduates. The aim was simply to determine the reliability of the measures, not to consider the relationships between them given the relatively small sample size. Additionally, it was intended to make sure the test battery wasn't laborious or incomprehensible. Descriptive statistics and alpha reliabilities calculated for each measure are shown in Table 3.2.

Table 3.2 Descriptive Statistics and alpha reliabilities for the test battery.

Measure	M	(SD)	Cronbach's alpha
Emotional intelligence			
1. Emotional perception	84.23	(13.52)	0.86
2. Emotional awareness	56.66	(6.16)	0.70
3. Emotional clarity	45.75	(5.32)	0.71
4. Emotional expression	82.43	(12.23)	0.75
Personality			
5. Neuroticism	27.83	(7.33)	0.78
6. Extraversion	34.25	(5.52)	0.70
7. Openness	36.45	(6.01)	0.71
8. Agreableness	34.12	(4.25)	0.70
9. Conscientiousness	37.22	(6.12)	0.77
Cognitive ability			
10. Verbal IQ	15.02	(4.22)	0.75
Well-being			
11. Anxiety-contentment	4.88	(1.20)	0.82
12. Depression-enthusiasm	5.23	(1.11)	0.80
Coping			
13. Coping total	68.25	(12.45)	0.79

In general, the summary statistics and reliabilities for the self-report measures were comparable to those obtained with the same measures in the past (e.g., Costa & McCrae, 1992; Davies et al., 1998; Heim, 1970; King & Emmons, 1990; Martinez-Pons, 1997), although differences due to the small sample size were expected. The measures were consequently deemed suitable for administration in the longitudinal studies. No changes were made to the test battery as a result of the pilot study.

Summary

This Chapter has identified a set of measures for EI, personality, cognitive ability, well-being and coping and justified the inclusion of each of these measures in two longitudinal studies (reported in Chapters 4 and 5). The entire test battery is presented in Table 3.3 below. The data collected from the longitudinal studies will be used to consider whether EP has performance and longitudinal effects. Chapter 4 assesses the reliability and validity of the measures, and examines the correlations between them. Chapter 5 considers the relationship between the APT and various different aspects of academic achievement in order to assess the predictive validity of EP. It also considers change across time in EP scores which may occur.

Table 3.3 Summary of the entire test battery of measures to be administered in the longitudinal studies.

Test	**Component assessed**	**Number of items**
Affective Perception Test (APT, described in Study 1)	Emotional perception	15
Attention sub-scale of the Trait Meta Mood Scale (Salovey et al., 1995)	Emotional awareness	13
Clarity sub-scale of the Trait Meta Mood Scale (Salovey et al., 1995)	Emotional clarity	11
Emotional Expressiveness Questionnaire (EEQ, King & Emmons, 1990)	Emotional expression	16
NEO-FFI (Costa & McCrae, 1992)	Personality	60
AH4 (Heim, 1970)	Verbal ability	20
Depression-Enthusiam Anxiety-Contentment (Warr, 1990)	Well-being	12
Cybernetic Coping Scale (CCS, Edwards & Baglioni, 1993)	Coping	20
		Total = 167

Chapter 4

Reliability, validity and correlations of emotional perception with other variables

Chapter 3 described a reliable set of measures for a test battery to be administered in two longitudinal studies. This Chapter describes the two studies, using two different samples, which aim to assess the reliability and validity of the measures and examine the relationship between EP, personality, cognitive ability, well-being and coping. Chapter 5 investigates the role of EP in performance, and presents further analyses from the two longitudinal studies in order to assess whether scores on all measures change over time. In order to adopt an inclusive approach, other aspects of EI are considered, but the studies focus on exploring the component of EP and examining its status within the EI construct.

A longitudinal design was employed as this was particularly suitable to assess the test-retest reliability and the predictive validity of the measures. It was also necessary to monitor changes over time as EI has been proposed as being an adaptive ability that may change with age and experience (e.g., Goleman, 1995). Participants supplied data at two measurement points in time with a six-month interval between the two measurements. This time appears to be long enough for possible changes in individual scores, but not too long for a high drop-out rate or for falsely inflating statistics such as test-retest reliability (Kline, 1993; Zapf, Dormann, & Frese, 1996). The target samples were trainee nurses and trainee managers as EP potentially has important consequences in occupational settings. An example of such an occupation is that of nursing, where self-awareness and awareness of the feelings of other people is central to work performance, as suggested by Bellack (1999):

"Emotional intelligence is both desirable and necessary in such a relationship-intense and service-based profession as nursing" (p.3).

Also, nurses have both an academic (i.e. degree based) component as well as a practical component which involves relating to other people at various levels (i.e. patients, staff and so on). Consequently, when assessing the predictive validity of EP, the effects on both academic grades and practical performance can be explored. Similarly, EI skills have proved to be useful for managers in the workplace where developing leadership skills, communication and identifying emotions of the workforce are essential for successful performance. Furthermore, management is

largely male dominated which is in contrast to nursing which is largely female dominated. There are interesting comparisons to be explored between the two groups, such as whether they both employ the same skills in similar or different ways, and whether various different aspects of EI have important roles to play in the different occupational groups. It is noted, however, that the main focus is to look for replication across the two groups, particularly in terms of the pattern of results for EP. Although differences between the samples will be considered, this is not the main concern.

In line with Study 1, it is hypothesised that the new measure of EP (the APT), will demonstrate good internal reliability scores and test-retest coefficients, will show a unitary factor solution, and that women will score higher on the scale than men. In line with research suggesting that EI consists of a set of related abilities (e.g., Dawda & Hart, 2000; Goleman, 1995; Mayer et al., 1999; Salovey & Mayer, 1990), it is predicted that EP will be related to other aspects of EI. Research has shown an overlap between EI and personality factors (e.g., Davies et al., 1998), as well as a link between EI and verbal IQ (e.g., Davies et al., 1998; Goleman, 1995; Salovey & Mayer, 1990), so it is predicted that EP will be correlated with both personality and verbal IQ, but will retain some independence. Finally, both theory and previous research has demonstrated a link between EI and emotional well-being (e.g., Warr, 1990), as well as EI and coping (e.g., Ciarrochi et al., 2002; Stanton et al., 2000), so it is predicted that EP will be correlated with these theoretically-relevant constructs.

The results for both phases of Study 2 are presented first, followed by the results for Study 3 across both phases. Similarities and differences between the samples are then considered followed by a general discussion.

Study 2 (phase 1)

Methods

Participants

A total of 178 first-year undergraduate nursing students (131 female and 47 male) participated in phase 1 of the study. The sample ranged from 18 to 50 years of age (M = 28.1, SD = 7.6). Participation in the study was voluntary.

Materials

In total participants completed four EI measures (EP, emotional awareness, emotional clarity, emotional expression), one personality inventory, measures of verbal IQ, well-being and coping. The full test battery is described in Chapter 3, with

additional information regarding the cognitive ability measure detailed below. A full list of materials can be found in Appendix B.2-3.

Cognitive ability

It was noted in Chapter 3 that two equivalent versions of the verbal IQ test were constructed. References to exact questions used in phase 1 were as follows: Q2, Q4, Q6, Q10, Q12, Q18, Q20, Q22, Q30, Q34, Q40, Q42, Q46, Q50, Q52, Q54, Q58, Q60, Q62, Q64.

Ethics

The cover sheet of each questionnaire pack contained details about the study including ethical practices. Informed consent was obtained by signature before participants completed the test battery. As part of the consent form, participants were asked to give permission to cross-reference data with academic records for the purposes of the longitudinal studies only, and were reminded that they would be unidentifiable from any records held on a computer or otherwise. The researcher was present throughout administration of the questionnaire packs to answer any further questions.

The data collected were confidential and anonymous, and participants were not identifiable except through use of a key which only the researcher had access to. The cover sheet of the questionnaire packs containing names and student numbers were discarded before data were entered into a computer. Participants were provided with detailed individual feedback on each of the questionnaires within three weeks of completing the test battery. The cover sheet for studies 2 and 3 can be found in Appendix B.2-3.

Procedure

The measures were administered to groups of between 20-25 participants over a 30 - 40 minute session.

Results

Summary Statistics and reliabilities

Descriptive statistics and alpha reliabilities calculated for each measure are presented in Table 4.1. In general, the summary statistics and reliabilities for the self-report measures were comparable to those obtained with the same measures in the past

(e.g., Costa & McCrae, 1992; Davies et al., 1998; Heim, 1970; King & Emmons, 1990; Martinez-Pons, 1997). Reliability scores were lower than desirable for some of the coping sub-scales (particularly Symptom reduction, Changing the situation and Accomodation which all had reliabilities of less than 0.60).

Table 4.1 Descriptive Statistics and alpha reliabilities for measures employed in Study 2 (phase 1).

Measure	M (SD)	Cronbach's alpha
Emotional intelligence		
1. Emotional perception	79.44 (11.68)	0.84
2. Emotional awareness	52.83 (5.16)	0.67
3. Emotional clarity	41.33 (4.82)	0.69
4. Emotional expression	76.96 (10.28)	0.70
Personality		
5. Neuroticism	26.84 (6.35)	0.77
6. Extraversion	31.54 (4.42)	0.68
7. Openness	33.22 (4.45)	0.62
8. Agreableness	35.72 (3.95)	0.64
9. Conscientiousness	34.83 (5.25)	0.75
Cognitive ability		
10. Verbal IQ	13.66 (2.59)	0.63
Well-being		
11. Anxiety-contentment	4.06 (0.81)	0.80
12. Depression-enthusiasm	4.36 (0.79)	0.78
Coping		
13. Changing the situation	13.52 (2.70)	0.54
14. Accomodation	12.96 (2.71)	0.56
15. Devaluation	12.24 (3.33)	0.69
16. Avoidance	11.62 (3.47)	0.72
17. symptom reduction	13.60 (2.71)	0.52
18. Coping total	63.93 (10.98)	0.85

Reliability and Factor analysis of the emotional perception scale

Factor analysis using the method of principal components (PCA) was conducted on the responses of the 178 participants to the 15-item APT. The criterion of salient loading was 0.30. The first four factors extracted in the initial solution had eigenvalues of 4.69, 1.27, 1.12 and 1.06, together accounting for 54% of the variance. Examination of the scree plot (see Appendix A.2-3) derived from the PCA showed a pronounced dip between the first and second components, indicating that one component would provide an appropriate solution for the APT. This component accounted for 31% of the variance and had loadings between 0.42 to 0.69. These

results confirm the factor structure for the APT obtained with Psychology students in Study 1.

The internal consistency reliability of the scores for the 15-item APT = 0.83. Following one cycle, item 11 was excluded resulting in an alpha level of 0.84. Item 11 referred to the game of "charades" with which a number of respondents were unfamiliar.

Sex differences

Women scored significantly higher on the APT than men, $t(176) = 2.63$, $p < 0.05$ (M=83.28; SD=12.95 and M= 75.31; SD=11.24, respectively).

Correlations with other variables

Intercorrelations among the 18 variables are presented in Table 4.2. With respect to the EI measures, correlations were in the expected direction and generally significant. EP scores were positively correlated with emotional awareness and emotional clarity, and to a greater extent with emotional expression. The TMMS sub-scales of awareness and clarity were not significantly correlated which is consistent with previous findings (Davies et al., 1998; Salovey et al., 1995).

In relation to personality, there was a considerable overlap between the EI variables of awareness and clarity with personality, and a moderate overlap between EP and expression with personality. Emotional awareness correlated with all of the big five personality dimensions, and was particularly related (0.38) to Agreeableness. This finding is in line with Davies et al. (1998) who found emotional awareness to load highly (0.68) on a factor which they labelled Agreeableness. Emotional clarity was also related to all five of the personality dimensions and was especially related (0.44) to Conscientiousness. In line with Salovey et al. (1995) there was a positive correlation with awareness and Neuroticism and a negative correlation with clarity and Neuroticism. In contrast, EP and emotional expression were only related to four of the big five personality dimensions, with neither being related to Neuroticism. Overall, EP and expression have lower correlations with personality than awareness and clarity.

In terms of cognitive ability, the only EI aspect related to verbal IQ was EP. The correlation was small (0.16) but significant. Consistent with previous research, verbal IQ was not related to the big five (Heim, 1970; Sternberg, 1999).

In reference to well-being, EP was positively related to anxiety-contentment, whereas none of the other EI variables were related to well-being. Both anxiety-contentment and depression-enthusiam were negatively related to Neuroticism, which is consistent with previous findings (Warr, 1990).

In terms of coping, the emotional awareness and EP aspects of EI were positively related to certain coping subscales and the overall coping score, whereas emotional clarity and expression were not correlated with any of the scales or total score. Coping was also positively related to the anxiety-contentment aspect of well-being. However, these results (particularly for the sub-scales of Symptom reduction, Changing the situation and Accomodation) are treated with caution due to the low reliabilities obtained for these scales. Further analyses only consider the total coping score which demonstrated good internal reliability.

Table 4.2 Correlations among all emotional intelligence, cognitive ability, personality, well-being, and coping variables employed in Study 2 (phase 1).

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Aware	-																	
2. Clarity	.10	-																
3. Express	.25 **	.27 **	-															
4. EP	.16 *	.34 **	.33 **	-														
5. Verbal	.01	.05	.08	.16 *	-													
6. Neuro	.25 **	-.31 **	.13	-.01	-.02	-												
7. Extra	.15 *	.35 **	.32 **	.23 **	.02	-.10	-											
8. Open	.20 **	.29 **	.29 **	.33 **	.14	-.08	.42 **	-										
9. Agree	.38 **	.33 **	.32 **	.33 **	.02	.05	.35 **	.23 **	-									
10. Cons	.15 *	.44 **	.18 *	.22 **	-.01	-.28 **	.40 **	.31 **	.42 **	-								
11. A-C	-.08	.11	-.03	.17 **	-.01	-.28 **	-.01	-.04	.07	.07	-							
12. D-E	-.04	.04	-.01	.06	.15 *	-.29 **	.09	.01	.06	.04	.62 **	-						
13. Situation	.10	.03	.07	.16 *	-.04	.05	-.01	.12	.08	-.00	.15 *	.10	-					
14. Accom	.15 *	.11	-.06	.06	-.11	.04	-.05	.10	.07	.02	.19 *	.12	.43 **	-				
15. Deval	.03	.06	-.05	.10	-.06	.05	-.04	.03	.07	.03	.08	-.04	.18 *	.52 **	-			
16. Avoid	.07	-.01	-.04	.07	-.19 *	.15	-.07	-.03	.05	-.02	.10	-.03	.25 **	.44 **	.72 **	-		
17. Reduc	.23 **	.05	.10	.25 **	-.02	.07	-.01	.15 *	.16 *	.00	.22 **	.22 **	.46 **	.28 **	.36 **	.51 **	-	
18. Cope tot	.16 *	.06	.00	.17*	-.12	.10	-.05	.09	.11	.01	.19 **	.09	.60 **	.72 **	.79 **	.83 **	.70 **	-

** $p < 0.01$
* $p < 0.05$

Study 2 (phase 2)

Methods

Participants

A total of 108 first-year undergraduate nursing students from phase 1 (82 female and 26 male) participated in phase 2 of the study. The drop-out rate was 39% which does not seem to be unusual according to the literature about participant drop-out (e.g., Hagenaars, 1990). Reasons for drop-out may be withdrawal from the course, change of module and so on. The sample ranged from 18 to 49 years of age (M = 28.2, SD = 7.4). Participation in the study was voluntary.

Materials

Participants completed the same test battery as in phase 1, with the exception of changes to the EP scale, verbal IQ and personality measure, which are detailed below. A full list of materials can be found in Appendix B.2-3.

EP

Following the removal of one unreliable item in phase 1, a 14-item APT was used in phase 2.

Verbal IQ

The questions selected from the AH4 were different from those used in phase 1 in order to create an equivalent version of the test. References to exact questions were as follows: Q2, Q4, Q8, Q12, Q16, Q18, Q20, Q24, Q28, Q32, Q34, Q36, Q40, Q44, Q48, Q50, Q52, Q56, Q60, Q62.

Personality

A shortened 30-item version of the NEO Five Factor Inventory (NEO-FFI, Costa & McCrae, 1992) was used to measure personality. Feedback from participants in phase 1 suggested the personality scale was laborious to complete, given all the other measures in the test battery, so the slight loss in percentage variance accounted for using the shortened scale was deemed to be worthwhile. Also, personality appears to be a stable trait which does not change much.

This scale was shortened by conducting linear regression in order to preserve the overall structure of the scale, but to reduce the number of items. The top 6-items for each aspect of personality which accounted for the greatest amount of variance were selected. Score reliabilities were then conducted for the new scales using the

responses from phase 1. Percentage variance (and score reliabilities) for Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness, were 95% (0.80), 91% (0.75), 91% (0.70), 91% (0.67) and 94% (0.80) respectively.

Procedure

The measures were administered to groups of between 20-25 participants over a 20 -30 minute session.

Results

Summary Statistics and reliabilities

Descriptive statistics, alpha reliabilities and test-restest reliabilities calculated for each measure are presented in Table 4.3. In general, the summary statistics and reliabilities for the self-report measures were comparable to those obtained with the same measures in the past (e.g., Costa & McCrae, 1992; Davies et al., 1998; Heim, 1970; King & Emmons, 1990; Martinez-Pons, 1997). Cronbachs alpha scores were lower than desirable for some of the coping sub-scales (particularly Symptom reduction, Changing the situation and Accomodation which all had reliabilities of less than 0.60). Generally, test-retest reliabilities were satisfactory to good, but coping scales were rather low (all were less than 0.50).

Table 4.3 Descriptive Statistics, alpha reliabilities and test-retest reliabilities (Pearson's r) for measures employed in Study 2 (phase 2).

Measure	M (SD)	Cronbach's alpha	Test-retest reliability
Emotional intelligence			
1. Emotional perception	74.23 (11.08)	0.88	0.75*
2. Emotional awareness	47.76 (6.57)	0.73	0.62*
3. Emotional clarity	37.67 (4.63)	0.69	0.65*
4. Emotional expression	71.45 (8.90)	0.71	0.70*
Personality			
5. Neuroticism	17.04 (4.39)	0.74	0.69*
6. Extraversion	21.96 (3.17)	0.67	0.70*
7. Openness	21.07 (3.05)	0.60	0.75*
8. Agreableness	21.78 (3.02)	0.62	0.74*
9. Conscientiousness	22.87 (3.25)	0.76	0.72*
Cognitive ability			
10. Verbal IQ	15.05 (2.27)	0.61	0.72*
Well-being			
11. Anxiety-contentment	3.99 (0.81)	0.83	0.80*
12. Depression-enthusiasm	4.32 (0.76)	0.81	0.75*
Coping			
13. Changing the situation	12.72 (0.79)	0.57	0.30*
14. Accomodation	12.51 (2.60)	0.59	0.48*
15. Devaluation	11.55 (3.30)	0.74	0.39*
16. Avoidance	10.80 (3.33)	0.74	0.49*
17. symptom reduction	13.32 (2.74)	0.55	0.45*
18. Coping total	60.90 (10.60)	0.85	0.48*

* $p < 0.01$

Reliability and Factor analysis of the emotional perception scale

Factor analysis using the method of principal components (PCA) was conducted on the responses of the 102 participants to the 14-item APT. The criterion of salient loading was 0.30. The first four factors extracted in the initial solution had eigenvalues of 5.60, 1.29, 1.09 and 1.05, together accounting for 64% of the variance. Examination of the scree plot (see Appendix A.2-3) derived from the PCA showed a pronounced dip between the first and second components, indicating that one component would provide an appropriate solution for the APT. This component accounted for 40% of the variance and had loadings between 0.47 to 0.82. These results confirm the factor structure for the APT obtained in Study 1 and in phase 1 of this study.

The internal consistency reliability of the scores for the 14-item APT was 0.84.

Sex differences

Women scored significantly higher on the APT than men, $t(106) = 2.90$, $p < 0.05$ (M=80.24; SD=10.87 and M= 71.77; SD=11.19, respectively).

Correlations with other variables

Intercorrelations among the 18 variables are presented in Table 4.4. Overall, the pattern of correlations are very similar to those in phase 1 of the study. EP scores were again positively correlated with the other EI measures, to the greatest extent with emotional expression. The magnitude of these correlations were small to moderate. As in phase 1, the TMMS sub-scales of awareness and clarity were not significantly correlated which was expected.

In relation to personality, the pattern was similar to phase 1, with any differences outlined below. The correlations between emotional awareness and clarity followed the same pattern as in phase 1, with both being related to all five personality dimensions. In contrast, EP was only realted to two, and emotional expression was only related to three of the big five personality dimensions. Neither were related to Neuroticism. As in phase 1, EP and expression shared lower correlations with personality than the other aspects of EI.

With respect to cognitive ability, the pattern of correlations were the same as phase 1. EP was the only EI variable to significantly correlate (0.18) with verbal IQ.

In contrast to phase 1, EP was not related to well-being, whereas emotional awareness and clarity were. Once again, both anxiety-contentment and depression-enthusiam were negatively related to Neuroticism.

In terms of coping, EP was the only EI variable positively related the overall coping score. Emotional clarity and expression were correlated with Avoidance and Symptom reduction respectively. Coping was also negatively related to verbal IQ. However, the accuracy of these results are questionable (particularly for the sub-scales of Symptom reduction, Changing the situation and Accomodation) due once again to the low reliabilities obtained for these scales. Further analyses only consider the total coping score which demonstrated good internal reliability. Change across time between phase 1 and 2 for scores on all measures are discussed in Chapter 5.

Table 4.4 Correlations among all emotional intelligence, cognitive ability, personality, well-being, and coping variables employed in Study 2 (phase 2).

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Aware	-																	
2. Clarity	-.02	-																
3. Express	.05	.20 *	-															
4. EP	.06 *	.14 *	.36 **	-														
5. Verbal	.01	.09	.03	.18 *	-													
6. Neuro	.23 **	-.32 **	-.04	-.06	-.09	-												
7. Extra	.23 *	.33 **	.28 **	.22 **	.04	-.17	-											
8. Open	.22 **	.28 **	.26 **	.29 **	.16	-.08	.31 **	-										
9. Agree	.31 **	.31 **	.17	.15	.16	-.11	.28 **	.22 **	-									
10. Cons	.28 **	.34 **	.21*	.09	-.09	-.31 **	.39 **	.28 **	.24 **	-								
11. A-C	-.26 **	.21 *	.06	.02	-.04	-.42 **	.29 **	-.09	.08	.35 **	-							
12. D-E	-.29 **	.15	.03	-.01	.26 **	-.43 **	.32 **	.08	.21	.22 *	.68 **	-						
13. Situation	-.04	.15	.09	.13	-.14	-.04	.23 *	.12	.17	.11	.04	.05	-					
14. Accom	.00	-.00	.01	.22 *	-.19 *	.09	.22 *	.01	.18	.20 *	.15	.03	.42 **	-				
15. Deval	.06	.03	.09	.14	-.20 *	.03	.01	-.12	.10	.04	.02	-.10	.14	.51 **	-			
16. Avoid	-.01	-.19 *	.00	.10	-.25* *	.11	.00	-.18	-.00	-.01	.00	-.13	.24 *	.48 **	.65 **	-		
17. Reduc	.15	.05	.21 *	.22 *	-.11	-.04	.30	.10	.20 *	.07	.17	.16	.45 **	.32 **	.39 **	.47 **	-	
18. Cope tot	.05	-.00	.12	.23 *	-.21*	.05	.20 *	-.03	.17	.10	.10	-.01	.56 **	.73 **	.77 **	.81 **	.71 **	-

** $p < 0.01$
* $p < 0.05$

Discussion

The results of the longitudinal study with nursing students support the contention that EP is a semi-independent ability within the EI construct. Principal Components Analysis (PCA) of the APT suggested a unitary component solution, and that 14 of the 15 items selected in phase 1 should be retained in the final version of the scale. The final scale showed good internal reliablity coefficients and test-retest reliability.

In terms of construct validity, women scored significantly higher than men on the APT, in line with Study 1. EP correlated with the EI scales of emotional clarity, emotional expression and emotional awareness. The magnitude of these correlations were small to moderate, which was to be expected in light of previous research which has conceptualised EI as being a set of related abilities (e.g. Davies et al., 1998; Goleman, 1995; Salovey & Mayer, 1990). EP was also related to theoretically relevant variables of well-being and coping, although due to a number of the coping sub-scales having unsatisfactory reliability scores, these results should be treated with caution.

The scale also showed evidence of discriminant validity in that it did not correlate highly with personality factors and verbal IQ. Although EP was related to four personality dimensions (Extraversion, Openness, Agreableness and Conscientiousness) in phase 1 and two (Extraversion and Openness) in the second phase, the magnitude of these correlations were small enough for the scale not to merely be an aspect of personality. Notably, Neuroticism does not correlate with EP and expression, yet does correlate with emotional awareness and clarity. In line with Salovey et al. (1995), there was a positive correlation between Neuroticism and emotional awareness, and a negative correlation between Neuroticism and emotional clarity. Importantly, in comparison with the other EI scales, the APT showed the lowest correlations with the five personality dimensions.

The APT was related to verbal IQ, as expected, but the correlation was small enough to suggest that the self report measure of EP is not overlapping highly with verbal IQ.

EP shared a small correlation with the anxiety-contentment aspect of well-being in phase 1, but was not related to well-being in phase 2, where it was more closely related to emotional awareness and claity. It has been shown that well-being changes greatly over time, but notably well-being shared a negative relationship with Neuroticism in both phases (Warr, 1990).

All components of EI were related to aspects of coping. The pattern of these relationships were quite different across the two phases. Coping scores were positively

related to well-being in phase 1 and negatively related to verbal IQ in phase 2. However, the results are treated with caution due to the unreliable nature of a number of the coping sub-scales.

Study 3 (phase 1)

This study was conducted in the same way as Study 2, with nursing students, but used a different sample. In particular, Study 3 focuses on generating further reliability and validity evidence for the APT. It is important to replicate the results of Study 2 in another sample, and it also permits the investigation of the different ways in which EP/EI and performance may relate (refer to Chapter 5).

Methods

Participants

A total of 145 first-year undergraduate management students (76 female and 69 male) participated in phase 1 of the study. The sample ranged from 18 to 47 years of age (M = 24.2, SD = 7.8). Participation in the study was voluntary.

Materials

The test battery was identical to that used in Study 2 (phase 2) with the exception of the verbal IQ measure which was the same as in Study 2 (phase 1). A full list of materials can be found in Appendix B.2-3.

Ethics

The protocols adopted were identical to those employed in Study 2.

Procedure

The measures were administered to groups of between 20-25 participants over a 20 -30 minute session.

Results

Summary Statistics and reliabilities

Descriptive statistics and alpha reliabilities calculated for each measure are presented in Table 4.5. In general, the summary statistics and reliabilities for the self-report measures were comparable to those obtained with the same measures in the past (e.g., Costa & McCrae, 1992; Davies et al., 1998; Heim, 1970; King & Emmons, 1990; Martinez-Pons, 1997) and in Study 2.

Table 4.5 Descriptive Statistics and alpha reliabilities for measures employed in Study 3 (phase1).

Measure	M	(SD)	Cronbach's alpha
Emotional intelligence			
1. Emotional perception	74.25	(10.16)	0.87
2. Emotional awareness	48.45	(5.29)	0.70
3. Emotional clarity	37.63	(4.64)	0.68
4. Emotional expression	73.68	(11.64)	0.71
Personality			
5. Neuroticism	17.65	(3.95)	0.70
6. Extraversion	22.57	(3.35)	0.71
7. Openness	19.94	(3.02)	0.60
8. Agreableness	21.52	(2.81)	0.62
9. Conscientiousness	22.12	(3.48)	0.73
Cognitive ability			
10. Verbal IQ	13.52	(3.27)	0.75
Well-being			
11. Anxiety-contentment	3.79	(0.85)	0.80
12. Depression-enthusiasm	4.37	(0.79)	0.77
Coping			
13. Changing the situation	13.00	(3.00)	0.76
14. Accomodation	11.99	(2.49)	0.65
15. Devaluation	11.19	(2.99)	0.80
16. Avoidance	10.54	(3.15)	0.78
17. Symptom reduction	12.95	(2.79)	0.67
18. Coping total	59.67	(9.49)	0.84

Reliability and Factor analysis of the emotional perception scale

Factor analysis using the method of principal components (PCA) was conducted on the responses of the 145 participants to the 14-item APT. The criterion of salient loading was 0.30. The first three factors extracted in the initial solution had eigenvalues of 5.37, 1.44, and 1.12, together accounting for 57% of the variance.

Examination of the scree plot (see Appendix A.2-3) derived from the PCA showed a pronounced dip between the first and second components, indicating that one component would provide an appropriate solution for the APT. This component accounted for 38% of the variance and had loadings between 0.52 to 0.71. These results confirm the factor structure for the APT obtained in studies 1 and 2.

The internal consistency reliability of the scores for the 14-item APT was 0.87.

Sex differences

Women scored significantly higher on the APT than men, $t(143) = 2.48$, $p < 0.05$ (M=78.43; SD=10.23 and M= 72.94; SD=9.98, respectively).

Correlations with other variables

Intercorrelations among the 18 variables are presented in Table 4.6. In general, the pattern of correlations were very similar to phases 1 and 2 of Study 2. The pattern of correlations between EP and other EI measures followed that of Study 2.

In relation to personality, the pattern was again consistent with Study 2. Emotional awareness and clarity correlated with all of the big five personality dimensions. Awareness was particularly related (0.30) to Agreeableness, and clarity was especially related (0.28) to Extraversion. In line with Study 2, EP and emotional expression had lower correlations with personality than the other EI components, and were only related to four of the big five personality dimensions, with neither being related to Neuroticism. Expression was especially related to Extraversion (0.42).

As in Study 2, EP was the only EI component to share a small (0.18) but significant correlation with verbal IQ.

In contrast to Study 2, there was a small positive correlation with EP and the depression-enthusiam aspect of well-being (0.17). Emotional clarity was positively related related to both anxiety-contentment (0.27) and depression-enthusiasm (0.31). Both aspects of well-being were negatively related to Neuroticism.

In terms of coping, in contrast to Study 2, emotional expression was the only aspect of EI to be positively related to certain coping subscales and the overall coping score. Coping was also positively related to the personality aspects of Extraversion and Conscientiousness.

Table 4.6 Correlations among all emotional intelligence, cognitive ability, personality, well-being, and coping variables employed in Study 3 (phase1).

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Aware	-																	
2. Clarity	.16	-																
3. Express	.30 **	.22 **	-															
4. EP	.18 *	.29 **	.35 **	-														
5. Verbal	.15	.07	.16	.18 *	-													
6. Neuro	.27 **	-.23 **	.06	.01	-.10	-												
7. Extra	.26 **	.28 **	.42 **	.24 **	.03	-.03	-											
8. Open	.23 **	.25 **	.31 **	.30 **	.13	-.12	.30 **	-										
9. Agree	.30 **	.18 *	.32 **	.27 **	.15	-.15	.18 *	.23 **	-									
10. Cons	.27 **	.22 **	.16 *	.22 **	.04	-.30 **	.29 **	.31 **	.21 *	-								
11. A-C	-.01	.27 **	.02	.04	.09	-.30 **	.19 *	.09	.14	.10	-							
12. D-E	.03	.31 **	.12	.17 *	.25 **	-.34 **	.43 **	.19 *	.23 **	.23 **	.60 **	-						
13. Situation	.15	.12	.24 **	.14	-26 **	-.22 **	.32 **	.20 *	-.04	.24 **	.14	.35 **	-					
14. Accom	-.02	-.08	.05	.09	-.23 **	.14	.11	-.07	.07	.14	-.15	06	.27 **	-				
15. Deval	-.02	.02	.00	.02	-.11	.10	.02	-.03	.09	.11	.07	.00	.05	.53 **	-			
16. Avoid	-.06	-.13	.03	-.02	-.10	.28 **	.09	.01	.06	.07	.08	-.07	-.05	.29 **	.66 **	-		
17. Reduc	.15	-.02	.24 **	.15	-.21 *	.07	.27 **	.20 *	.22 **	.23 **	.14	.20 *	.16	.13	.38 **	.50 **	-	
18. Cope tot	.07	-.03	.17 *	.13	.01	.12	.24 **	.09	.12	.24 **	.09	.16	.43 **	.65 **	.79 **	.75 **	.66 **	-

** $p < 0.01$
* $p < 0.05$

Study 3 (phase 2)

Methods

Participants

A total of 74 first-year undergraduate management students from phase 1 (39 female and 35 male) participated in phase 2 of the study. The drop-out rate was 49% which is 10% more than in Study 2, although still not unusual according to the literature. The sample ranged from 18 to 47 years of age (M = 24.1, SD = 7.2). Participation in the study was voluntary.

Materials

The test battery was identical to that used in phase 1 of the study with the exception that an equivalent version of verbal IQ was used, which was the same as in Study 2 (phase 2). A full list of materials can be found in Appendix B.2-3.

Procedure

Identical to phase1.

Results

Summary Statistics and reliabilities

Descriptive statistics, alpha reliabilities and test-retest reliabilities calculated for each measure are presented in Table 4.7. In general, the summary statistics and reliabilities for the self-report measures were comparable to those obtained with the same measures in the past (e.g., Costa & McCrae, 1992; Davies et al., 1998; Heim, 1970; King & Emmons, 1990; Martinez-Pons, 1997) and Study 2. Reliability scores were lower than desirable for some of the coping sub-scales (particularly Symptom reduction and Accomodation) with reliabilities of less than 0.60. Test-retest reliabilities were generally good, but as with the nurses, coping sub-scales were rather low (all less than 0.60).

Table 4.7 Descriptive Statistics, alpha reliabilities and test-retest reliabilities (Pearson's r) for measures employed in Study 3 (phase 2).

Measure	M (SD)	Cronbach's alpha	Test-retest reliability
Emotional intelligence			
1. Emotional perception	70.01 (11.26)	0.84	0.78*
2. Emotional awareness	47.47 (6.19)	0.72	0.60*
3. Emotional clarity	36.05 (4.57)	0.60	0.65*
4. Emotional expression	69.39 (9.49)	0.65	0.69*
Personality			
5. Neuroticism	17.65 (3.83)	0.66	0.66*
6. Extraversion	20.56 (3.13)	0.70	0.71*
7. Openness	19.36 (2.94)	0.60	0.72*
8. Agreableness	20.14 (2.83)	0.63	0.73*
9. Conscientiousness	21.24 (3.08)	0.70	0.70*
Cognitive ability			
10. Verbal IQ	13.47 (2.65)	0.70	0.70*
Well-being			
11. Anxiety-contentment	3.67 (0.78)	0.71	0.76*
12. Depression-enthusiasm	4.08 (0.70)	0.72	0.72*
Coping			
13. Changing the situation	12.91 (2.22)	0.60	0.50*
14. Accomodation	12.49 (1.84)	0.59	0.45*
15. Devaluation	11.47 (2.79)	0.60	0.59*
16. Avoidance	11.23 (2.84)	0.60	0.50*
17. Symptom reduction	12.24 (2.18)	0.58	0.54*
18. Coping total	60.34 (8.07)	0.73	0.59*

* $p < 0.01$

Reliability and Factor analysis of the emotional perception scale

Factor analysis using the method of principal components (PCA) was conducted on the responses of the 74 participants to the 14-item APT. The criterion of salient loading was 0.30. The first five factors extracted in the initial solution had eigenvalues of 4.34, 1.50, 1.37, 1.23, and 1.11 together accounting for 68% of the variance. Examination of the scree plot (see Appendix A.2-3) derived from the PCA showed a pronounced dip between the first and second components, indicating that one component would provide an appropriate solution for the APT. This component accounted for 31% of the variance and had loadings between 0.35 to 0.68. These results confirm the factor structure for the APT obtained in studies 1 and 2 and phase 1 of this study.

The internal consistency reliability of the scores for the 14-item APT was 0.84.

Sex differences

Women scored significantly higher on the APT than men, $t(72) = 2.62$, $p < 0.05$ (M=76.41; SD=11.23 and M= 69.57; SD=11.44, respectively).

Correlations with other variables

Intercorrelations among the 18 variables are presented in Table 4.8. The patterns are generally very similar to phase 1 of Study 3 with any differences discussed below. In terms of the EI measures, the pattern of correlations were the same as phase 1.

In relation to personality, the pattern was generally the same as phase 1. Attention and clarity were again related to all five aspects of personality, but in this phase, clarity was especially related (0.28) to Conscientiousness. EP was only related to two of the big five personality dimensions (Openness and Agreeableness). Emotional expression was only related to three of the big five personality dimensions, and was especially related to Agreeableness (0.31). Once again, EP and expression had lower correlations overall with personality than the other EI variables.

In terms of cognitive ability, the pattern of results were the same as phase 1 with EP representing the only EI aspect related to verbal IQ.

In reference to well-being, there was a postive correlation with EP and depression-enthusiam (0.24), which was also positively related to emotional clarity (0.27) and verbal IQ (0.25). Anxiety-contentment was not related to any of the other variables.

In terms of coping, the sub-scale of Changing the situation was positively related to expression (0.25) and Extraversion (0.23). None of the other coping sub-scales or the overall coping score were related to any of the other variables. Changes over time between phase 1 and 2 for all measures are considered in Chapter 5.

Table 4.8 Correlations among all emotional intelligence, cognitive ability, personality, well-being, and coping variables employed in Study 3 (phase 2).

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Aware	-																	
2. Clarity	.15	-																
3. Express	.35 **	.30 **	-															
4. EP	.20 *	.21 *	.37 **	-														
5. Verbal	.14	.19	.23	.28 *	-													
6. Neuro	.24 *	-.31 **	.06	.09	-.03	-												
7. Extra	.28 *	.27 *	.26 *	.18	.07	-.04	-											
8. Open	.25 *	.30 **	.25 *	.24 *	.21	.06	.28 *	-										
9. Agree	.30 **	.25 *	.31 **	.26 *	.18	-.01	.24 *	.25 *	-									
10. Cons	.26 *	.28 *	.19	.20	.02	-.20	.22	.30 **	.28 *	-								
11. A-C	.05	.20	.09	.04	-.02	-.21	.21	.19	.18	.07	-							
12. D-E	.13	.27 *	.06	.24 *	.25 *	-.22	.16	.19	.21	.20	.55 **	-						
13. Situation	.22	.03	.25 *	.20	-21	-.14	.23 *	.22	.06	.09	-.01	.19	-					
14. Accom	-.03	-.11	.08	.10	-.07	.00	.06	.07	-.07	.04	-.15	03	.49 **	-				
15. Deval	-.11	-.18	.07	.11	-.14	.00	-.09	.02	-.17	-.09	.02	-.10	.19	.49 **	-			
16. Avoid	-.09	-.10	.03	.05	-.21	.08	-.13	-.03	-.17	-.10	.07	-.05	.11	.29 *	.70 **	-		
17. Reduc	.08	.02	-.02	.05	-.03	.20	-.02	-.06	.04	-.04	.10	.02	.20	.08	.19	.37 **	-	
18. Cope tot	.00	-.11	.08	.16	-.11	.12	-.00	-.07	-12	-.04	.02	-.03	.55 **	.66 **	.81 **	.79 **	.54 **	-

** $p < 0.01$
* $p < 0.05$

Discussion

The results of Study 3 with management students further strengthen the contention that EP represents a semi-independent ability within the EI construct. As in Study 2, the APT had a unitary component, scores showed good internal reliablity coefficients and test-retest reliability.

In terms of construct validity, women scored significantly higher than men on the APT, in line with studies 1 and 2. EP shared small to moderate correlations with the EI scales of emotional clarity, emotional expression and emotional awareness, as in Study 2. EP was also related to the depression-enthusiam aspect of well-being, but not to any of the coping sub-scales or overall coping score. Coping was positively corelated with the EI aspect of expression, as predicted in the lieterature. The coping sub-scales generally had satifactory reliablities in phase 1, but were questionable in phase 2. Overall, the coping scales had higher reliability scores than with the nursing sample.

The scale evidenced discriminant validity in that it did not correlate highly with personality factors and verbal IQ, as in Study 2. Although EP was related to four personality dimensions (Extraversion, Openness, Agreeableness and Conscientiousness) in phase 1 and two (Openness and Agreeableness) in the second phase, the magnitude of these correlations were small enough for the scale to be independent from personality. The relationship between Neuroticism and EI variables was the same as in Study 2. Importantly, once again, the APT showed the lowest correlations with the five personality dimensions in comparison with the other aspects of EI.

The relationship between the APT and verbal IQ was the same as in Study 2 (discussed earlier).

In terms of well-being, EP correlated positively with the depression-enthusiasm aspect in both phases. Anxiety-contentment was positively related to the EI aspect of emotional clarity in phase 1. Both aspects of well-being shared a negative relationship with Neuroticism in both phases.

Emotional expression was the only EI variable positively related to coping scores in both phases, as would be predicted by the literature (Ciarrochi et al., 2002; Stanton et al., 2000). Coping scores were also postively related to the personality aspect of Extraversion. Although the results are treated with caution due to the unreliable nature of some of the coping sub-scales, generally, the reliablities were satisfactory with the management sample.

Similarities and differences between the two samples

Comparisons between the two samples were not the main focus of the longitudinal studies. Of more concern was replicating reliability and validity evidence for the measures, particularly the EP scale, and considering whether the measures were independent from personality and cognitive ability. This section summarises the similarities and differences between the two samples, and suggestions are made for why some of the findings may have occurred. It is noted, however, that further research in this area is necessary before detailed conclusions can be drawn. Full independent groups t-tests tables for phases 1 and 2 are presented in Appendix A.2-3.

In terms of descriptive statistics, generally managers scored lower overall on all EI variables, which is in line with the literature (e.g., Bellack, 1999; Goleman, 1995) suggesting that so called caring professions (such as nursing or policing) would score higher on EI variables than business related professions (such as management and retail).

In reference to personality, the only factor where managers scored higher than nurses across both phases was Extraversion. Perhaps they were specifically encouraged to outwardly show their emotional feelings, which would be perceived as demonstrating confidence and leadership skills in the field of management training more so than nursing.

Scores on verbal IQ were no different between the samples in phase 1, and managers scored significantly lower than nurses in phase 2.

In reference to well-being, the groups did not score significantly different in terms of depression-enthusiasm, but managers scored lower in both phases on anxiety-contentment. This could be due to specific academic demands on the management group or personal reasons.

Managers scored significant lower on coping variables than nurses in phase 1, but scored no lower than nurses on all but one of the coping scales in phase 2. This may be due to coping strategies they developed during the 6-month gap between the phases, or just that stress demands were higher for managers at phase 1. One of the limitations of the studies is not being able to control or measure the changes occuring between the testing phases. Alternatively, the fact that the coping scales had low reliability scores (particularly for the nursing sample) may have influenced the results.

The alpha reliability scores for EI, personality, verbal IQ and well-being measures were generally acceptable to good across all phases for both samples. EP for example ranged between 0.84 and 0.88. The notable difference was for the coping measure where many of the scales had unsatisfactory reliability scores in the nursing sample, but were generally acceptable to good in the management sample. The results for the coping scales were subsequently treated with caution. Test-retest reliabilities

were generally acceptable to good for both samples with EP scoring the highest of all the EI measures in both groups. The exception again was the coping scales where the test-retest reliabilities were very low for the nurses and notably higher (although still lower than desirable) for managers.

The factor structure of the APT was remarkably similar across all four phases of the studies with a unitary factor providing the most appropriate solution each time.

In terms of the correlations between the variables, the results were very similar across both samples, especially concerning EP. The APT showed small to moderate correlations with the EI scales of emotional clarity, emotional expression and emotional awareness, which was expected in light of previous research which has conceptualised EI as being a set of related abilities (e.g., Davies et al., 1998). Of all the EI variables, EP was most closely related to emotional expression for both nurses and managers. Demonstrating discriminant validity, EP did not correlate highly with personality or verbal IQ across all four phases. EP shared a small correlation with verbal IQ across the two phases for both samples. Although EP was related to the same four personality dimensions (Extraversion, Openness, Agreeableness and Conscientiousness) in phase 1 for both samples, and only two personality dimensions (Extraversion and Openness in nurses; Openness and Agreeableness in managers) in phase 2, the magnitude of these correlations were small enough for EP not to be considered as merely an aspect of personality. Notably, across both samples, Neuroticism did not correlate with EP and expression, yet did correlate with awareness and clarity. Overall, the APT showed the lowest correlations with the five personality dimensions across both samples.

Further validity evidence was demonstrated in that EP was related to theoretically relevant variables of well-being and coping across the two samples. In terms of well-being, the results across the two samples were similar in that both demostrated positive correlations between EI and aspects of well-being. Furthermore, emotional clarity was positively related to both aspects of well-being across the two samples. EP, however, was positively related to anxiety-contentment in nurses, and positively related to depression-enthusiasm in managers. Again, this could be due to different demands placed on each sample resulting in EP having different effects across groups, an issue worthy of further investigation in the future. With the exception of clarity, the correlations between EI measures and well-being were relatively small across both samples.

The pattern of results for coping were quite different across the two samples. In phase 1 of the nursing sample, awareness and EP were positively related to coping scores, whereas in phase 2, clarity, expression and EP were positively related to aspects of coping. However, the alpha reliability scores for the coping scales were

unsatisfactory in the nursing sample, so the results were treated with caution. In contrast, expression was the only EI variable related to coping scores across both phases in the management sample. These results may be more valid, given the higher alpha reliability scores obtained with the management sample, and would be expected in terms of the literature (Ciarrochi et al., 2002; Stanton et al., 2000).

To summarise, given that there were no controls or specific training programs implimented for either sample, the results were remarkably consistent. This was particularly apparent for EP in terms of its factor structure and reliability, its relationship with other EI variables and its independent status over personality and cognitive ability.

General discussion

The successful measurement of EP presents a significant challenge, but its identification as an important component of EI makes its measurement a worthwhile aim. Consistent with Davies et al. (1998), the results of studies 2 and 3 suggest that EP represents a semi-independent ability within the EI construct. Davies et al. (1998) called for the development of a reliable instrument to assess EP, and the results of these studies provide additional support for the reliability and construct validity for a new measure of EP (the APT) described in Chapter 2.

The factor structure of the APT was almost identical across the two samples. Principal Components Analysis (PCA) of the APT suggested a unitary component solution, as in Study 1 using Psychology undergraduates, and that 14 items should be retained in the final version of the scale. Scores on the 14-item scale also showed good internal reliability coefficients.

In Study 1, the APT showed evidence of construct validity. Scores were stable over time, women scored significantly higher than men on the APT, and scores on the APT were related to an objective measure of EP, demonstrating its sound theoretical basis. The scale also evidenced discriminant validity in that scores on the APT were not related to scores on the ACT, the measure from which it was developed. Studies 2 and 3 provide additional validity evidence for the APT. In terms of construct validity, in line with Study 1, scores were stable over the 6-month period with test-retest reliabilities exceeding 0.70 in studies 2 and 3. Across all four phases of the studies, women scored significantly higher than men on the APT, in line with Study 1. Additionally, the APT correlated with other EI components including emotional clarity, emotional expression and emotional awareness, and was also related to theoretically relevant variables of well-being and coping. The scale showed evidence

of discriminant validity in that it did not correlate highly with personality factors and verbal IQ.

EI has been classified as a type of ability within the traditional intelligence framework (e.g., Dawda & Hart, 2000; Goleman, 1995; Mayer et al., 1999; Salovey & Mayer, 1990). One of the criteria for an ability is that there should be positive correlations between measures (Davies et al., 1998). This criterion was supported by the observation that EP correlates positively with a number of other measures of EI. The positive correlation of EP with the attention sub-scale of the TMMS suggests that identifying and being aware of one's own emotions is associated with the ability to perceive the emotions of others. Similarly, the positive correlation of EP with the clarity sub-scale of the TMMS indicates that being able to understand and discriminate among one's own emotions relates to perceiving emotions in others. Furthermore, it seems that the more emotionally expressive an individual is, the more skilled they are at perceiving the emotions of others, as indicated by the relationship between EP and the EEQ. Across both samples, EP is more closely related to expression than the other EI variables of awareness and clarity.

The results of studies 2 and 3 demonstrate a complex relationship between personality and the various different aspects of EI. In phase 1 of both studies, all aspects of EI correlate with four of the big five personality dimensions (Extraversion, Openness, Agreeableness and Conscientiousness). However, Neuroticism does not correlate with EP and expression, yet does correlate with emotional awareness and clarity. In phase 2 of both studies, once again awareness and clarity correlate with all five aspects of personality including Neuroticism. EP was related to two of the big five personality dimensions and expression related to three, with neither being related to Neuroticism. In line with Salovey et al. (1995), there was a positive correlation between Neuroticism and emotional awareness, and a negative correlation between Neuroticism and emotional clarity. Notably, EP and expression showed lower correlations with the big five personality dimensions than awareness and clarity.

To summarise these findings, it appears that Neuroticism is related to aspects of EI concerned with mood regulation/control of feelings (i.e. emotional awareness and clarity) but not with those concerning the perception and expression of emotion.

In line with previous research demonstrating a link between EI and verbal IQ (e.g., Davies et al., 1998; Goleman, 1995; Salovey & Mayer, 1990) there was a small but significant correlation between EP and verbal IQ across all four phases of the studies. EI has been defined as being a type of *ability* within the *information-processing* approach and would therefore be expected to share some correlation with other cognitive ability factors, namely verbal IQ which involves understanding emotions in self and others. EP was the only EI variable to correlate with verbal IQ,

but the fact that this correlation was not too high indicates that the APT is measuring more than just those skills of verbal reasoning required when one is asked to ascribe the appropriate label to a situation or intention.

Both theory and previous research suggests a link between EI and emotional well-being. The results of studies 2 and 3 show positive correlations between aspects of EI and well-being across both samples. EP was positively related to anxiety-contentment in nurses and positively related to depression-enthusiasm in managers. Clarity was positively related to both aspects of well-being across the two samples. These results are consistent with research indicating that EI is associated with various aspects of well-being (as discussed in Chapter 1). Also consistent with the literature, both anxiety-contentment and depression-enthusiasm were negatively related to Neuroticism across all four phases.

It makes sense that clarity was the EI variable most closely related to aspects of well-being. Clarity measures an individual's ability to understand and discriminate among their own emotions, which would presumably help with developing the ability to regulate emotional health and maintain a positive outlook. Being aware of one's own emotions (assessed by emotional attention) and perceiving the emotions of others (assessed by EP) are necessary but not perhaps the most fundamental aspects of EI concerned with regulating well-being. The ability to express emotions would seem more likely to be related to stress relief mechanisms (i.e., "letting it all out") than specifically regulating one's own well-being. It is not surprising, therefore, that correlations between EI variables and well-being were generally quite small, with the exception of clarity which were small to moderate.

In terms of coping, a different pattern was observed across the two samples. In phase 1 of the study with nurses, EP and awareness were positively related to coping scores, whereas in phase 2, EP was positively related to three aspects of coping, with clarity and expression being related to one aspect. The alpha reliabilities for the coping scales were unsatisfactory in the nursing sample rendering the results as being somewhat questionable. In the management sample, expression was the only EI variable related to coping scores across both phases. This is in line with previous research suggesting expression is more closely related to coping than other EI variables (Ciarrochi et al., 2002; Stanton et al., 2000). In general, alpha reliablities were acceptable to good in the management sample and notably higher than with the nursing sample, so it would seem that these results are more valid.

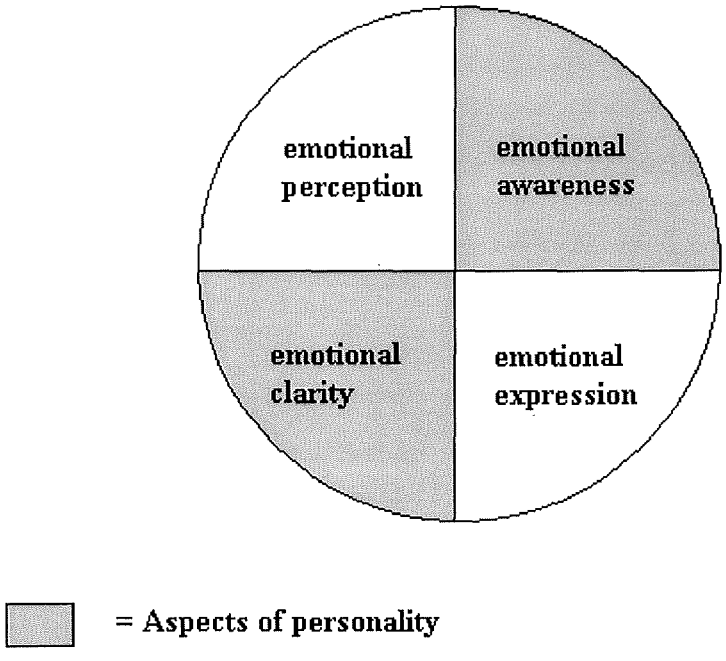
In conclusion, consistent with Davies et al. (1998) the results of studies 2 and 3 suggest that EP is tapping a semi-independent ability within the EI construct. Further support has been generated for the APT in terms of reliability and validity evidence. In general, the results are very similar across both samples, especially in terms of the

factor structure and reliablity of the EP scale, the relationship between EP and the other EI variables and the independent status of EP over personality and cognitive ability. Chapter 5 explores the predictive validity of EI and considers changes over time, for all measures, which may have occurred.

Revised model of emotional intelligence

A model of EI was proposed in Chapter 3 (see Fig 3.1). From the results of studies 2 and 3, it appears that EP and expression remain the potential independent components of EI, whereas attention and clarity are simply aspects of personality. This is illustrated in Fig 4.1. Emotional awareness overlaps particularly with the personality dimension Agreeableness, while emotional clarity is especially related to Conscientiousness. Both awareness and clarity significantly correlate with Neuroticism, which is not related to EP and expression.

Fig 4.1 The revised model of emotional intelligence.



Chapter 5

Predictive validity of emotional perception and change across time

Chapter 4 described two studies investigating the reliability and validity of EP and its correlations with other variables. The results of these studies suggest that EP represents a semi-independent construct within EI. The scale designed to assess EP (the APT, described in Chapter 2) was reliable, scores were stable over time and a one-factor solution was consistently obtained. In terms of construct validity, EP was related to other EI components, well-being and coping, and women scored higher than men on the scale. The scale did not overlap to any great extent with personality and cognitive ability, demonstrating discriminant validity. This Chapter presents data pertaining to academic performance in order to assess whether EP evidences predictive validity. Additionally, further analyses from studies 2 and 3 are presented in order to assess whether scores on the measures change during the 6-month time gap between testing phases.

EI has been heralded as a predictor of successful performance, both in terms of occupational effectiveness and academic achievement. The former however, has received the lion's share of research to date. Many of the proposed claims for the predictive validity of EI abilities have been anecdotal and results have been rather mixed (as discussed in Chapter 1), so further investigation is required.

The structure of this Chapter follows that of the previous one. The results of Study 2 are presented first, followed by the results of Study 3. Similarities and differences between the two samples are then considered followed by a general discussion.

Study 2

This section describes the collection of data and analyses regarding academic performance and presents additional analyses from the data set to assess change in scores across time.

Academic achievement

Four grades were obtained for each individual in order to assess academic achievement. The first was an overall grade for a module in information technology assessing computer and technical skills through both coursework and examination. The second was an overall grade for a module in nursing assessing understanding of nursing practices and theories through both coursework and examination. The third was a seminar grade derived from individual seminar presentations given to groups of around 30 nursing undergraduates at the end of the nursing module. Although tutors graded these presentations, they did not constitute part of the formal assessment and were therefore independent of nursing grades. The forth was an overall grade for a module in human biology assessing bodily function through multiple choice questions (MCQ's) and an examination with short answer questions.

Academic grades were obtained from academic tutors and pertained to nursing undergraduates all studying at the time of administering questionnaires. For details about confidentiality procedures adopted refer to Chapter 4 (Study 2, phase 1).

Results

Correlations with other variables

Correlations among the academic achievement measures and the other 18 variables are presented in Table 5.1. IT grades were positively related (0.21) to verbal IQ and negatively related (-0.15) to the depression-enthusiasm aspect of well-being. Nursing grades were positively related to EP (0.31) and to a lesser extent with expression (0.15) and Openness (0.17). Seminar grades were positively related (0.58) to EP and Openness (0.27), and to a lesser extent with Conscientiousness (0.20), verbal IQ (0.18) and clarity (0.16). Biology grades did not significantly correlate with any of the other variables.

Table 5.1 Correlations among academic achievement measures and emotional intelligence, cognitive ability, personality, well-being and coping variables.

Measure	IT grade	Nursing grade	Seminar grade	Biology grade
Emotional intelligence				
1. Emotional perception	.03	.31 **	.58 **	.15
2. Emotional awareness	-.06	.11	.10	-.15
3. Emotional clarity	-.01	.03	.16 *	.09
4. Emotional expression	.00	.15 *	.12	-.11
Personality				
5. Neuroticism	-.03	-.01	-.01	.05
6. Extraversion	-.03	.02	.03	-.08
7. Openness	.01	.17 *	.27 **	-.15
8. Agreeableness	.02	.05	.10	.01
9. Conscientiousness	.10	.05	.20 **	-.07
Cognitive ability				
10. Verbal IQ	.21 **	.14	.18 *	.09
Well-being				
11. Anxiety-Contentment	-.06	.00	.03	.04
12. Depression-Enthusiasm	-.15 *	-.08	-.01	-.04
Coping				
13. Situation	-.11	-.07	.11	-.09
14. Accomodation	-.04	-.06	.02	-.11
15. Devaluation	.02	.03	-.03	-.01
16. Avoidance	-.02	.03	-.08	.07
17. Reduction	-.12	.04	.05	-.13
18. Coping total	-.07	-.00	.01	-.07
Academic achievement				
19. IT grade	-	.39 **	.18 *	.25 **
20. Nursing grade	-	-	.36 **	.09
21. Seminar grade	-	-	-	.02
22. Biology grade	-	-	-	-

** $p < 0.01$
* $p < 0.05$

Predictive validity

Multiple regression analyses were conducted to determine the degree to which performance on EI measures, personality, verbal IQ, well-being and coping predict academic achievement. Multiple regression analyses were not conducted on the biology grades as they did not correlate with any of the predictor variables. The remaining three measures of academic achievement were independent in terms of assessment, although there were small but significant correlations between them as would be expected. Information technology grades correlated with nursing grades ($r = 0.39$, $p < 0.05$) and to a lesser extent with seminar presentation grades ($r = 0.18$, $p < 0.05$). Nursing grades were related to seminar presentation grades ($r = 0.36$, $p < 0.05$).

Multiple regression analyses on information technology grades

4% of the variance in information technology grades was explained by the 13 predictors [$F(13,164) = 1.53$, n.s.].

Multiple regression analyses on nursing grades

9% of the variance in nursing grades was explained by the 13 predictors [$F(13,164) = 2.23$, $p < 0.05$], with EP scores making the greatest contribution.

Multiple regression analyses on seminar presentation grades

40% of the variance in seminar presentation was explained by the 13 predictors [$F(13, 164) = 10.01$, $p < 0.05$], with EP scores making the greatest contribution. The results of the multiple regression analyses are presented in Table 5.2.

Table 5.2 Multiple regression of Information Technology (IT) grades, nursing grades and seminar presentation grades on emotional intelligence, personality, verbal IQ, well-being and coping variables.

	IT grades		Nursing grades		Seminar presentation grades	
Predictor	Beta	Unique variance (%)	Beta	Unique variance (%)	Beta	Unique variance (%)
Emotional intelligence						
1. Emotional perception	.008	0	.303 **	7	.619 **	33
2. Emotional awareness	-.070	0	.089	0	.019	0
3. Emotional clarity	-.084	0	-.135	1	-.017	0
4. Emotional expression	.009	0	.078	0	-.070	0
Personality						
5. Neuroticism	-.049	0	-.103	0	.072	0
6. Extraversion	-.038	0	-.050	0	-.264 **	8
7. Openness	-.027	0	.083	0	.166 *	3
8. Agreeableness	.036	0	-.061	0	-.109	2
9. Conscientiousness	.142	1	.014	0	.203 *	4
Cognitive ability						
10. Verbal IQ	.250 **	6	.105	0	.058	0
Well-being						
11. Anxiety-contentment	.078	0	.068	0	-.048	0
12. Depression-enthusiasm	-.255 **	4	-.172	1	.030	0
Coping						
13. Coping total	-.015	0	-.036	0	-.104	2
	R = .11	Adjusted R^2 = .04	R = .15	Adjusted R^2 = .09	R = .44	Adjusted R^2 = .40

** $p < 0.01$
* $p < 0.05$

Change over time between phase 1 and phase 2 of Study 2

A summary of change over time for the nursing students is provided below. Full repeated measures t-test tables between all variables across phase 1 and 2 can be found in Appendix A.2-3.

During the 6-month time gap between testing phases, scores on most measures decreased, with the exception of verbal IQ and certain aspects of personality which increased. Also, Neuroticism scores along with four of the coping scales were no different over time. The magnitude of the differences were generally moderate. Changes in EI variables were expected according to the literature (e.g., Goleman, 1995) which suggests that EI is adaptable. However, it was somewhat surprising that none of the scores for EI measures increased. There was no control during the 6-month time gap between testing, and perhaps with specific training programs, scores may have improved.

During phase 1 nurses completed a 60-item personality scale, but used a reduced 30-item measure in phase 2. In order to compare across both phases, a new score was calculated for phase 1 using only the 30-items later used in phase 2. In terms of Neuroticism scores, there was no change over time, but scores on the other four aspects of personality increased. The magnitude of the differences for personality were generally lower than for other variables, indicating that it is a relatively stable trait.

Scores on verbal IQ increased over time, even though an equivalent version of the measure was used in phase 2. This could be due to improved performance at phase 2 or that the group found the equivalent version somewhat easier.

The fact that well-being scores changed over time is consistent with the literature (e.g., Warr, 1990) suggesting fluctuations are likely to occur for a multitude of job-related and personal reasons.

There were no significant differences in scores on four of the coping scales over the 6-month period, but the overall coping score decreased over time. This could be due to the fact that only certain coping strategies were required, that coping in general was not required, or that the questionable reliability of the measure (particularly the sub-scales) influenced the results.

It is acknowledged that this avenue of research needs to be explored more fully in order to more thoroughly assess the implications of change across time. This would however detract from the central issue of the thesis, but is worth exploring in future research.

Summary

EP evidenced predictive validity when assessing academic achievement. APT scores had the highest contribution of all predictor variables when accounting for seminar presentation grades and nursing grades. EP did not explain any of the variance in IT or biology grades which were assessed using more traditional methods. Overall, APT scores were positively related to academic achievement, more so than other aspects of EI, personality, verbal IQ, well-being and coping.

There was evidence of scores changing over the 6-month time gap between the testing phases, lending support to the claim that EI components may be adaptive. This also suggests that EI, or aspects of it, are more likely to be abilities than stable traits such as aspects of personality.

Study 3

The structure of this section follows that of Study 2. Data pertaining to academic performance are considered first, followed by an analysis of change across time.

Academic achievement

One overall grade was obtained for each individual in order to assess academic achievement. This was for a module in management assessing understanding of managers practices and theories through both coursework (25%) and exam (75%). Separate scores for each individual were obtained for both the coursework and exam components.

Confidentiality procedures and obtaining academic grades were conducted in the same way as in Study 2.

Results

Correlations with other variables

Correlations among the academic achievement measure and the other 18 variables are presented in Table 5.3. With respect to the aspects of the academic achievement measure, total management grades were positively related to emotional awareness (0.30) and verbal IQ (0.27) in particular, and negatively related (-0.30) to Neuroticism. Exam scores were positively related to emotional awareness (0.30) and to a lesser extent with

Openness (0.23) and verbal IQ (0.22), and were negatively related to Neuroticism (-0.28) and Accomodation coping (-.21). Coursework grades were positively related to verbal IQ (0.42) and Openness (0.24) in particular, and negatively related to Neuroticim (-0.23).

Table 5.3 Correlations among the three aspects of the academic achievement measure and emotional intelligence, cognitive ability, personality, well-being and coping variables.

Measure	Managing grade total (%)	Managing grade exam (75%)	Managing grade c/w (25%)
Emotional intelligence			
1. Emotional perception	.13	.16	.17
2. Emotional awareness	.30 **	.30 **	.18 *
3. Emotional clarity	.09	.08	.01
4. Emotional expression	.06	.09	.21 *
Personality			
5. Neuroticism	-.30 **	-.28 **	-.23 **
6. Extraversion	.14	.16	.12
7. Openness	.22 *	.23 **	.24 **
8. Agreeableness	.11	.10	.18 *
9. Conscientiousness	.20 *	.18 *	.09
Cognitive ability			
10. Verbal IQ	.27 **	.22 *	.42 **
Well-being			
11. Anxiety-Contentment	.17	.13	.13
12. Depression-Enthusiasm	.22 *	.18 *	.20 *
Coping			
13. Situation	.12	.08	.10
14. Accomodation	-.16	-.21 *	-.21 *
15. Devaluation	-.08	-.13	-.02
16. Avoidance	-.12	-.14	-.08
17. Reduction	.14	.11	.22 *
18. Coping total	-.03	-.08	.01
Academic grades			
19. Managing grade total (%)	-	.99 **	.70 **
20. Managing grade exam (75%)	-	-	.65 **
21. Managing grade c/w (25%)	-	-	-

** $p < 0.01$
* $p < 0.05$

Predictive validity

Multiple regression analyses were conducted to determine the degree to which performance on EI measures, personality, verbal IQ, well-being and coping predict academic achievement. Separate scores for each individual were obtained for both the coursework and exam components, so there were significant correlations between the three aspects as would be expected. The total management grade (%) correlated with exam scores ($r = 0.99$, $p < 0.05$) and to a lesser extent with coursework scores ($r = 0.70$, $p < 0.05$). Exam scores were related to coursework scores ($r = 0.65$, $p < 0.05$). The total management grade (%) was not included in the multiple regression analyses as the correlation with exam scores was effectively perfect.

Multiple regression analyses on exam scores (75%)

14% of the variance in exam scores was explained by the 13 predictors [$F(13,115) = 2.62$, $p < 0.05$], with emotional awareness scores making the greatest contribution.

Multiple regression analyses on coursework scores (25%)

16% of the variance in coursework scores was explained by the 13 predictors [$F(13,115) = 2.95$, $p < 0.05$], with verbal IQ scores making the greatest contribution. The results of the multiple regression analyses are presented in Table 5.4.

Table 5.4 Multiple regression of exam scores and coursework scores on emotional intelligence, personality, verbal IQ, well-being and coping variables.

	Exam scores (75%)		Coursework scores (25%)	
Predictor	Beta	Unique variance (%)	Beta	Unique variance (%)
Emotional intelligence				
1. Emotional perception	.041	0	.019	0
2. Emotional awareness	.299 **	7	.034	0
3. Emotional clarity	-.082	0	-.147	2
4. Emotional expression	-.122	1	.112	0
Personality				
5. Neuroticism	-.231 *	4	-.117	1
6. Extraversion	.063	0	-.120	1
7. Openness	.155	2	.169	3
8. Agreeableness	-.026	0	.058	0
9. Conscientiousness	.076	0	.080	0
Cognitive ability				
10. Verbal IQ	.055	0	.325 **	9
Well-being				
11. Anxiety-contentment	.027	0	.044	0
12. Depression-enthusiasm	.034	0	.055	0
Coping				
13. Coping total	-.095	0	-.030	0
	R = .23	Adjusted R^2 = .14	R = .25	Adjusted R^2 = .16

** $p < 0.01$
* $p < 0.05$

Change over time between phase 1 and phase 2 of Study 3

A summary of change over time for the management students is provided below. Full repeated measures t-test tables between all variables across phase 1 and 2 can be found in Appendix A.2-3.

Across phase 1 and phase 2, most of the scores on the measures decreased, with the exception of verbal IQ, aspects of personality and coping which did not change over time. In general, the magnitude of the differences were small to moderate. Similar to the findings for Study 2, scores on the EI variables changed over time, even if somewhat surprisingly they decreased. As with the nursing sample, there was no control during the

interim period between testing. Perhaps had the managers been given specific training techniques, their EI scores may have improved.

In terms of personality, Neuroticism and Openness scores did not change over time, but scores on the other three aspects of personality decreased. The magnitude of the differences for personality were generally lower than for other variables, indicating that it is a relatively stable trait.

Verbal IQ scores were no different over time. This suggests that the equivalent version used in phase 2 was of the same difficulty level as the original version used in phase 1.

Well-being scores were also no different over time, which may seem somewhat surprising considering the nature of well-being which is expected to fluctuate with life events, therefore usually changing over time. However, they may have been fluctuations within the sample where some scores increased and others decreased, resulting in a net effect of zero.

There was no difference in any of the coping scores over time. As with nurses, this could be attributed to the fact that specific coping mechanisms were not required to any great extent at either phase, or a result of poor internal reliability scores on the measure. However, in general, reliability scores for the coping scale were higher with managers than for nurses, so the results should be treated with less caution in this particular sample.

As mentioned in Study 2, more research needs to be conducted in order to comment further on these issues.

Summary

In reference to academic achievement, emotional awareness made the greatest contribution to predicting exam scores and verbal IQ contributed most to predicting coursework scores. EP did not contribute to predicting academic achievement in the management sample, but the measures were of a more traditional format somewhat like the IT and biology grades assessed in Study 2.

As with the nursing sample, there was evidence of scores changing over the 6-month time gap between the testing phases, suggesting that EI components may be abilities which are adaptive.

Similarities and differences between the two samples

In terms of performance, predictive validity of the variables in relation to academic achievement was demonstrated in both samples. However, in nurses, EP made the greatest contribution to performance, whereas in managers, emotional awareness and verbal IQ made the greatest contribution. This appears to be a result of the type of performance being assessed rather than differences across the groups per se. By nature of the course, nurses were assessed using more practical methods (such as seminar presentations) and were required to demonstrate skills (such as communication and understanding) which were more likely to be related to EP. Thus EP was related to seminar presentation and nursing grades but not to IT and biology grades, where methods of assessment were more traditional and required the demonstration of technical skills. The results for the IT grades for nurses were similar to the results of the management sample, where again the form of assessment was more traditional. Thus EP was not related to the academic achievement measure in managers.

In reference to changes over time between phase 1 and phase 2, an overall similarity between the samples was that scores on most variables tended to decrease over time. The magnitude of the differences between testing phases were generally smaller for managers than for nurses. Scores on all four EI variables decreased within the 6-month time gap in both samples.

In terms of personality, the difference between the samples were that scores on four of the personality scales increased slightly by phase 2 for nurses, whereas scores on three of the scales decreased slightly by phase 2 for managers. The similarities were the fact that although in different directions, the magnitude of the differences for both samples were generally smaller than most other variables, indicating that personality is relatively stable over time. Furthermore, scores on Neuroticism were no different over time for either sample.

In reference to verbal IQ, scores increased slightly over time for nurses, but were no different for managers. An equivalent version of the test was used in phase 2 for both samples and it may just be that nurses found this equivalent test somewhat easier than the first, or scored higher due to practice effects.

Scores on well-being changed over time for nurses but not for managers. Aspects of well-being constantly change over time for different reasons, so initially it may seem surprising that scores remained stable for managers. However, as discussed earlier, this may be due to fluctuations within the group resulting in no change overall. The change for the nursing sample could be due to the demands of the course (such as a vital essay to

submit prior to administration of the questionnaire pack in phase 2) or due to personal events.

Coping scores did not change over time for either sample, but it was difficult to ascertain whether this was because there was no increased demands requiring coping strategies, or a result of problems with the reliability of the measure.

General discussion

The fact that predictive validity is an important aspect of intelligence seems to have escaped many of the current conceptualisations of EI (Davies et al., 1998; Dulewicz & Higgs, 1998a; 1998b). There is a lack of empirical evidence to demonstrate the predictive validity of EI, and many claims have been anecdotal (as discussed in Chapter 1). The data reported here focused on the predictive validity of the variables in relation to academic achievement. In Study 2 with nurses, of all the predictor variables (other EI components, verbal IQ, personality, well-being and coping), EP had the greatest contribution when predicting both seminar presentation and nursing grades. Those people who scored higher on EP achieved better academic grades. This effect was greater for seminar presentation than nursing grades, a result that can be interpreted as reflecting the greater contribution of EP to performance related assessment where skills such as closely monitoring other people's reactions in order to make a good seminar presentation are fundamental. More traditional methods of assessment such as essay writing and examinations require a different set of skills. Skills such as communication and understanding were required in the nursing module, whereas the IT module for example, required demonstration of technical and computer skills. Although both were assessed by coursework and examination, skills necessary for the nursing module were more closely related to what is being measured by EP. Consequently, EP scores made a contribution to predicting nursing grades, but were not related to information technology grades. Similarly, the biology module required the demonstration of more traditional skills assessed by examination and MCQ, which is not closely related to what is being measured by EP.

In the management sample, academic achievement was measured by a module assessing management practices and theories through exam and coursework. EP was not related to academic achievement scores, which again were assessed by more traditional means. Emotional awareness made the greatest contribution to exam scores, whereas verbal IQ was most important for coursework scores. In contrast to nurses, emotional

awareness had an influence over managers academic achievement scores. This may be due to the fact that managers are trained to focus on emotions within themselves, and may use self-awareness to a greater extent when completing tasks (Dulewicz, 1994; Dulewicz & Higgs, 1999). Nurses on the other hand are primarily trained to focus on the emotions of others, hence EP may play a more important role when they complete tasks and problems.

To summarise, it appears that EP demonstrates predictive validity, particularly when performance involves practical skills. It may therefore be more accurate to say that EP predicts performance in terms of communication/practical ability rather than academic achievement per se.

Researchers need to specify clearly not only which particular aspect of EI is being measured, but also which aspect of performance is being assessed. Individual components of EI may predict different aspects of academic achievement, which is one of the reasons for conflicting findings within the literature on the predictive validity of EI. The data from studies 2 and 3 have shown that the EI-performance relationship can only be explored when both sides of the coin have been thoroughly operationalised. EI abilities may be limited in their application to certain types of performance, if we define performance in terms of intellectual capacity and traditional assessments, but may be crucial for other aspects of performance, such as practical presentations. This is important work which needs to be conducted, but is not the focus of the thesis.

EI has been described as an adaptive ability that may change with age and experience (e.g., Goleman, 1995). This view is supported by the fact that EI variables changed over time for both nurses and managers. It was somewhat surprising perhaps that the scores decreased, but nevertheless the claim that EI variables are adaptive was supported. This may not occur naturally, but it is possible that with specific training schemes targeted to improve EI skills, scores may increase over time. Furthermore, these results suggest that EI is more of an *ability* related to traditional forms of intelligence as proposed by the information-processing approach (Mayer et al., 1999) and less likely to be a stable *trait* like personality.

Although EP appears to be semi-independent (see Chapter 4) and potentially useful with long-term effects, the longitudinal studies leave the unanswered question of whether EP has a role to play in actual behaviour. The questionnaire based nature of studies 2 and 3 makes this question impossible to address, and it has been suggested (Petrides & Furnham, 2000) that the status of the EI construct needs to be explored using experimental methodologies not purely relying on self-report data. The following study, therefore, examines the effects of EP in a social setting using a quasi-experimental design

with objective measures. In the longitudinal studies, EP had particular influence over practical performance (i.e., when giving seminar presentations), so may have an important role to play in successful interpersonal interactions. The study described in the following Chapter uses embarrassment as a framework to evaluate the role of EP in the social environment when giving group presentations. This is a move towards obtaining objective, rather than purely self-report data.

Chapter 6

Emotional perception in the social environment

"The rate at which a person can mature is directly proportional to the embarrassment he can tolerate."

Doug Englebart (1980)

The first part of this thesis used self-report methods to investigate the influence of EP on performance and to assess whether it had longitudinal effects. It was demonstrated (in Chapter 5) that EP influenced practical performance when giving seminar presentations. As a result, it was suggested that EP may have an important role to play in social situations. These effects cannot be investigated using questionnaire-based methods, so this part of the thesis describes a study using quasi-experimental methods to investigate the effects of EP in the social environment.

EP clearly relates to the perception of self and others which is likely to have implications in social settings. Individuals who are good at perceiving emotions in other people would presumably react accordingly in a social situation, thus may develop more successful personal interactions. EP is likely to be related to a number of social emotions, in particular self-conscious emotions such as embarrassment, shame, guilt and pride. These emotions involve complex cognitive processes, such as the evaluation of one's behaviour from a self-perspective, as well as from considering the effect one's behaviour may have on other people. The three self-conscious emotions of embarrassment, shame and guilt constitute a cluster of emotions relating to transgression, shortcomings or failures, and Keltner & Buswell (1997) argue that the distinction between them arises in the type of violation which occurs. The antecedents of embarrassment involve a violation of social convention which increase social vulnerability or exposure, whereas guilt is related to the transgression of moral rules and shame to failures to live up to expectations of others or society in general. In one particular study, participants listed few of the same antecedents for embarrassment and shame (9% overlap) or embarrassment and guilt (5% overlap, Keltner & Buswell, 1997). Another study found that embarrassment occurred more frequently during public, interpersonal interactions than shame and guilt, and the antecedents of shame and guilt were rated as being twice as moral in their connotations as those of embarrassment (Tangney, Miller, Flicker, & Barlow, 1996). Embarrassment, more so than shame and guilt, occurs during public, interpersonal

interactions and seems to implicate the "outer" or public self rather than the "inner" or private self (e.g., Goffman, 1967; cited in Keltner & Buswell, 1997).

As stated above, the area in which EP is most likely to have theoretical implications is in social environments involving interpersonal relations. It was therefore decided that using the framework of embarrassment would be a useful way in which to investigate the effects of EP. Embarrassment was chosen as it is more likely to occur in a public setting than the other self-conscious emotions and represents the "outer" self, making it easier to measure than some of the other self-conscious emotions.

Despite our sometimes all too frequent experience of the cause and effects of this self-conscious emotion, its position within the social sciences has been unclear. Some researchers (e.g., Keltner & Buswell, 1997; Miller, 1996) view embarrassment as being a key social emotion, crucial in maintaining successful interpersonal relations and playing a key role in socialisation practices such as the negotiation of social roles and status, motivation of behaviour, development of the conscious and conformity. In contrast, traditional emotion researchers (e.g., Darwin, 1872; Izard, 1977) have largely ignored embarrassment. It does not appear as a 'basic' emotion and is not even held as distinct by many, being seen as a version of shame, sadness and fear by different theorists.

In general, there has been a lack of research on embarrassment and findings are often inconsistent. Chapter 6 discusses research from the embarrassment literature pertaining to the selection of a suitable method for the study, and to evaluating the potential role of EP in social interaction. For a justification of why embarrassment should be classified as a distinct emotion, and a detailed discussion of the five major theories of embarrassment, refer to Keltner & Buswell (1997).

First, this Chapter considers the different methodological approaches which have been employed to investigate the detection of embarrassment, and assesses the relative contribution of perceptivity and expressivity to responses associated with embarrassment. Second, the role that EP, in conjunction with expressivity and empathy, may have to play in the experience of embarrassment is evaluated in Study 4.

Detecting embarrassment

It is necessary that embarrassment is recognisable by others in order for it to have reliable interpersonal effects. Also recognition of others' embarrassment is said to underly the experience of "empathic embarrassment" in which observers find it

distressing to witness others' embarrassment (Marcus & Miller, 1999). Practically, assurances that embarrassment is typically obvious may help reduce stress in awkward social situations. Knowing that making one's discomfort plain may increase social approval, becoming embarrassed may be a sufficient reaction to many social predicaments (Miller, 1996).

Research has shown that in general, people are accurate judges of embarrassment. Across a series of five studies, Keltner (1995) found that people accurately identified embarrassment in spontaneous videotapes. Observers tended to evaluate expressions according to a prototype of the embarrassment display. Accuracy was correlated with the number of signs of embarrassment in the display, peaking at 92% when the prototypical display was shown. The prototypical display unfolds in the following reliable sequence: gaze aversion; a smile control, which is a lower facial action that potentially inhibits the smile; a non-Duchenne smile, which only involves the zygomatic muscle action that pulls the corners of the lips upward; a second smile control; head movement down; and then face touching, which occurred about 25 % of the time. Across studies, observers identified shame with above chance accuracy, but infrequently (approx. 5% of the time across studies) confused shame and embarrassment. Embarrassment has also been identified accurately from still photographs and there is some evidence to suggest that it is recognised cross-culturally (Keltner & Buswell, 1997). However the use of static photographs or selected videotapes may lack the informativeness of complex, interpersonal environments in which embarrassment naturally occurs.

There is a lack of research in general focusing on the recognition of embarrassment, and even fewer studies have presented observers with displays of embarrassment in natural settings. In response to criticisms of traditional methods, Marcus & Miller (1999) asked female members of small groups to perform either an embarrassing task (dancing to pre-recorded music) or an innocuous task while their peers watched them from an adjacent room. Each participant performed, and each rated the embarrassment of each of her peers. Social relations analyses on the resulting round-robin data demonstrated that observers generally agreed about the extent of the particular person's embarrassment, despite their perceptual idiosyncrasies.

These data suggest that live displays of embarrassment are recognisable by others, but can be criticised on two main grounds. First, performers were not asked to provide self-reports of embarrassment, so although there was a high degree of consensus among observers, it is impossible to determine whether the audiences' perceptions were accurate. Second, although the stimuli were more ecologically valid than photographs or videotapes, the embarrassment-eliciting task was still somewhat

artificial. The study was conducted in a controlled laboratory setting and participants' reactions may have differed in important ways from embarrassment occurring in everyday life.

Taking these concerns into account, Marcus & Miller (1999) examined the interpersonal perception of embarrassment during a natural, real-life situation which often elicits embarrassment. 207 participants in various university courses judged the embarrassment felt by their peers during classroom presentations, and reported how they themselves felt during their own presentations. The resulting round-robin data demonstrated that naturally occurring embarrassment is recognisable by others; audiences agreed about who was and who was not embarrassed, and their judgements were reliably correlated with the targets' self-reports of embarrassment. The results suggest that intense embarrassment is usually obvious, with perceptual idiosyncracies emerging in observers' judgements only when the presenters' reactions are less severe. In contrast, empathic embarrassment differed from perceptions of others' embarrassment per se, and depended more on perceiver idiosyncrasies than the behaviour of the target. Although this study could not determine the specific information observers were using to estimate embarrassment in others, and did not measure observers' ability to distinguish embarrassment from related states, it demonstrated the methodological improvement of using round-robin data in a naturalistic setting.

The contribution of perceptivity and expressivity to detecting embarrassment

It has been suggested that interpersonal sensitivity results from a combination of perceptivity and expressivity with neither being considered to the exclusion of the other (Snodgrass, 1985; Snodgrass, 1992). A number of studies suggest that expressivity of participants contributes a large portion of the variance to interpersonal sensitivity. For example, Sabatelli, Buck, & Dreyer (1982) analysed communication accuracy between married couples and found the greatest percentage in variance was accounted for by sender and unique relationship effects and that little variance was accounted for by receiver effects. Nakamura, Buck, & Kenny (1990) found this expressive behaviour contributed more to perceivers judgements than other contextual information. Ambady, Hallahan, & Rosenthal (1995) found that expressive individuals were more easy to judge accurately. In a clinical setting, it has been shown to be relatively easy to determine the thoughts and feelings of two out of three targets from their expressive behaviour (Marangoni, Garcia, Ickes, & Teng, 1995). Furthermore, in a study examining the effects of gender and leadership roles, results

indicated that interpersonal sensitivity was associated more with high expressivity on behalf of the sender than with the perceiver's perceptivity. Finally, specific to embarrassment, Marcus & Miller (1999) found that perceptions of embarrassment involved a combination of the information provided by the targets (28% of the variance) and from the idiosyncratic viewpoints of the perceivers (23% of the variance). In contrast, perceiver variance (39%) clearly outweighed target variance (0.08%) in reports of empathic embarrassment. Audience members experienced sympathetic reactions to their peers not so much because of their peers' behaviour, but because of their own idiosyncrasies.

There are a number of criticisms of studies which have attempted to assess the relative contributions of perceptivity and expressivity to embarrassment ratings. First, many studies have simply measured embarrassment ratings of the target and audience, correlating the responses to check if judgements were accurate and to see the relative contribution of expressivity from the target and perceptivity of the audience. Furthermore, studies have focused mainly on the accuracy of audience perceptions of embarrassment and have largely ignored factors which may affect the targets embarrassment level.

Study 4

Taking into consideration the various methodological approaches and criticisms of previous research (outlined above), it seems that the investigation of embarrassment needs to be conducted in natural settings. Also, a wider range of variables which may affect target's embarrassment levels, in particular, need to be assessed. Consequently, Study 4 investigates the effects of EP in a natural social setting by measuring embarrassment ratings during class presentations, in addition to a variety of potential mediating factors. The issue is not necessarily whether perceptivity, expressivity or empathy make the greatest contribution to embarrassment ratings per se, but how they may effect targets and audiences in different ways.

From a theoretical perspective, Study 4 aims to assess the effects of EP in a social environment by using ratings of embarrassment in a real–life setting, and the degree to which target levels of EP, expressivity and empathy predict these. From a practical perspective, knowledge about factors which affect embarrassment levels may make situations such as class presentations less daunting. In most cases, misperceptions of embarrassment levels lends people to believe they are more easily embarrassed than others which could lead them to fear embarrassing circumstances to

a needless extent. This could have an undesirable influence on subsequent interactions.

It is predicted that presenters will rate themselves as more embarrassed than audience members rate them. Presenters' ratings will be a function of how embarrassed the audience rates them as being and presenter perceptibility. Audience ratings will be a function of how embarrassed the presenter rates themselves as being and presenter expressivity.

Methods

Participants

At the beginning of the semester, students were informed of the aims and nature of the study which would be conducted during a first year Psychology course. It was explained that participation would involve completion of a set of three questionnaires, and ratings of class presentations which would occur during the module. Informed consent was obtained from interested volunteers. Initially 188 undergraduates volunteered to participate in the study, however, because a complete set of round–robin ratings was necessary (i.e., every participant must rate and be rated by every other participant), students who did not present, or who had multiple absences could not be included in the final analysis. These exclusion criteria resulted in a final sample of 109 participants (34 male, 75 female) ranging from 18 – 45 years old (Mean = 27.2, SD = 7.2). All students made a formal class presentation in groups of 4 or 5. Participants were given 30 minutes experimental participation to count towards the two hours required for the module if they took part in the study.

Materials

The presenters' self–ratings of embarrassment were measured using three pairs of semantic differential items of proven utility (see Apsler, 1975; "embarrassed – unembarrassed"; "poised – awkward"; and "composed – flustered"), on a 7–point scale. Scores on these three scales were combined into one overall score for embarrassment. The same items were also used to assess audience members' perceptions of how embarrassed each presenter appeared. EP was assessed using the 14–item APT (as used in studies 2 and 3). Emotional expression was assessed using the 16–item Emotional Expressiveness Questionnaire (EEQ, King & Emmons, 1990), also used in studies 2 and 3, and empathy was assessed using a 33–item measure of emotional empathy (Mehrabian & Epstein, 1970). All three questionnaires were rated on a 7–point scale ranging from strongly disagree (1) to strongly agree (7).

Procedure

During the initial session at the beginning of the semester, participants completed the APT, EEQ and empathy scale.

Throughout the semester, whenever a student made a class presentation, each member of the class was given an evaluation form with which to judge the speaker's embarrassment. These forms included Apsler's (1975) pairs of semantic differential items with space for any additional comments. The audience completed the form as the presentation progressed, rating each presenter in turn. Then, immediately following the presentation, each presenter used the same set of items to indicate how they had felt during the talk. Presenters were urged to focus on the presentation itself and to not think about the ratings the audience were providing.

Results

The three semantic differentials for the embarrassment scale correlated highly so were combined as a single measure. These correlations are presented in Table 6.1.

Table 6.1 Correlations among the semantic differentials for embarrassment ratings.

Semantic differential	1	2	3
1. Embarrassed-unembarrassed	-		
2. Poised-awkward	.73 *	-	
3. Composed-flustered	.77 *	.80 *	-

* $p < 0.01$

The means and standard deviations for both the self-report measures and embarrassment ratings were similar across all eight classes, plus the fact that the classes were all run in the same fashion each week with a relatively equal number of students, the data from all eight classes were combined for the final analysis. A table of descriptive statistics for all variables across the eight groups is presented in Appendix A.4.

Summary statistics

Descriptive statistics calculated for each measure are presented in Table 6.2. In general, the summary statistics for the self–report measures were comparable to those obtained with the same measures in the past (e.g., Apsler, 1975; King & Emmons, 1990; Mehrabian & Epstein, 1970).

Table 6.2 Means and standard deviations for all variables.

	Mean	(SD)
1. EP of presenters	71.84	(9.30)
2. Emotional expression of presenters	74.23	(12.13)
3. Empathy of presenters	157.02	(17.94)
4. Presenters' embarrassment ratings of themselves	9.63	(4.17)
5. Audience embarrassment ratings of presenters	7.75	(2.10)

Correlations

Intercorrelations among the five variables are presented in Table 6.3. EP scores were positively correlated with emotional expression, as in studies 2 and 3, but were not related to empathy scores. Emotional expression and empathy were positively related. EP scores were related to presenters' embarrassment ratings of themselves, where people with high EP rated themselves as feeling less embarrassed during their talk than people with low EP. EP scores of presenters were not related to audience ratings of presenters' embarrassment. In line with previous research, emotional expression was related to audience embarrassment ratings of presenters. Specifically, audience members rated highly expressive presenters as being less embarrassed than presenters who were less expressive. Emotional expression was related, to a lesser extent, with presenters embarrassment ratings: Presenters with higher scores on expression rated themselves as being less embarrassed during talks than those with low expression scores. Finally, as predicted in the literature, presenters' embarrassment ratings of themselves were positively related to audience embarrassment ratings with audience members rating presenters as less embarrassed than they actually felt.

Table 6.3 Correlations among self – report questionnaires and embarrassment ratings.

Measure	1	2	3	4	5
1. EP of presenter	-				
2. Expression of presenter	.33 *	-			
3. Empathy of presenter	.02	.27 *	-		
4. Presenters' emb ratings of themselves	-.38 *	-.25 *	.06	-	
5. Audience emb ratings of presenters	-.06	-.48 *	-.15	.28 *	-

* $p < 0.01$

Comparing audience embarrassment ratings with presenter ratings

As predicted, audience members tended to rate presenters as being significantly less embarrassed than they actually felt [$t(108) = 4.76$, $p < 0.05$].

Analyses of presenters' embarrassment ratings of themselves

A multiple regression analysis (all variables entered) with presenters' self-ratings as the dependent variable and presenters' self-reported EP, expressivity and empathy, plus audience embarrassment ratings as predictor variables.

Only presenter EP and audience ratings made significant contributions to predicting presenters' embarrassment ratings, together accounting for 19% of the variance [$F(4,104) = 7.47$, $p < 0.05$]. These results are presented in Table 6.4.

Table 6.4 Multiple regression of presenters' embarrassment ratings of themselves on the self – report measures and audience embarrassment ratings of presenters.

	Presenters' embarrassment ratings of themselves	
Predictor	Beta	Unique variance (%)
1. EP	-.349 **	13
2. Expressivity	-.063	0
3. Empathy	.118	0
4. Audience ratings	.246 *	6
	R = .22	Adjusted R^2 = .19

** $p < 0.01$
* $p < 0.05$

Analyses of audience embarrassment ratings of presenters

A multiple regression analysis (all variables entered) with audience ratings of presenter embarrassment as the dependent variable, and presenter self-ratings of embarrassment, EP, expressivity and empathy as the predictor variables was conducted. In contrast with the earlier analysis, only presenter self-ratings of embarrassment and self-report of emotional expressivity made significant contributions, together accounting for 21% of the variance [$F(4,104) = 8.20$, $p < 0.05$]. These results are presented in Table 6.5.

Table 6.5 Multiple regression of audience embarrassment ratings of presenters on the self – report measures and presenters' embarrassment ratings of themselves.

	Audience embarrassment ratings of presenters	
Predictor	Beta	Unique variance (%)
1. EP	.172	2
2. Expressivity	-.410 **	14
3. Empathy	-.053	0
4. Presenters' ratings	.241 *	5
	R = .24	Adjusted R^2 = .21

** $p < 0.01$
* $p < 0.05$

Discussion

Embarrassment often results from performing in front of an audience, and is even more likely to occur if a mistake is made. Class presentations involve conspicuousness and increase the importance of social evaluation and so often elicit embarrassment. Study 4 examined instances of real-life embarrassment occurring through class presentations, in order to determine the effects of EP in a social environment. The main aims were to assess the accuracy of audience ratings of embarrassment in a natural environment, to assess the contribution of EP, expressivity and empathy to embarrassment ratings, and to determine how they may affect presenters and audiences in different ways. Limitations of the method used include the fact that the attention of the audience may have been directed to the presenters' emotions, and may have been influenced by practice effects over time. However, the method was considerably more ecologically valid than many previous studies of embarrassment and emotion recognition (Marcus & Miller, 1999).

The results of Study 4 indicate that audience members can accurately identify embarrassment in live, naturalistic settings, and that EP and expressivity both

contribute to embarrassment ratings with EP having more of an influence over presenters' embarrassment ratings of themselves, and expression influencing audience embarrassment ratings of presenters. Empathy had no effect on embarrassment ratings. Each of these effects is discussed in more detail below.

Audience members were able to accurately identify how embarrassed a presenter was. These data therefore provide naturalistic support for the notion that the embarrassment display is a clear signal which can be readily decoded by observers. Although no measure was taken of the nature of these displays, and in particular whether they followed the prototypical sequence of events identified by Keltner & Buswell (1997), it is clear that experienced embarrassment is generally easily perceived. In addition, and as predicted, although audience members' ratings were reliable predictors of presenters' self-ratings of embarrassment, audience members tended to rate presenters as being less embarrassed than they actually felt. These data are important in two respects: From a theoretical viewpoint, the fact that embarrassment is recognisable in a natural setting is a necessary requirement for embarrassment to exert reliable interpersonal effects. From a practical perspective, these data offer reassurance to people who feel they appear extremely embarrassed. In general we do not appear to be as embarrassed as we feel. Wider dissemination of findings such as this may increase confidence levels and reduce fear, thus hopefully leading to greater enthusiasm for delivering presentations as well as the multitude of other activities which commonly lead to feelings of embarrassment.

As predicted, presenters' embarrassment ratings of themselves were a function of EP, and not expressivity or empathy. Individuals with high scores on EP rated themselves as being less embarrassed during a presentation than individuals with low scores on EP. The ability to perceive the emotions of others is of significant importance when assessing the successfulness of a presentation delivery. Individuals with high EP are more accurate at assessing the emotional display of others and presumably can monitor and adjust their performance in a social setting accordingly. The reassurance which comes with having a good idea of how your audience are responding makes a presenter feel more at ease, thus reducing embarrassment levels during a talk. Skills such as closely monitoring audience reactions during a talk appear to be fundamental to a successful performance. Neither expressivity nor empathy significantly affected presenters' self-ratings of embarrassment.

Audience ratings of presenters were largely a function of presenter's expressivity scores. Audience members rated presenters with high expressivity as being less embarrassed than presenters with low expressivity. It seems that presenters who expressed themselves more during talks were perceived by audience members as being less embarrassed than individuals who were less expressive. This is in line with

previous research showing expressivity to be an important factor when inferring the thoughts and feelings of others. For example, Ambady et al. (1995) found that expressive individuals were more "legible," or easy to judge accurately and Marangoni et al. (1995) found that it was possible to infer emotions of two out of three targets from their expressive behaviour. Neither EP nor empathy significantly affected audience embarrassment ratings of presenters.

Audience ratings were not affected by presenter's empathy scores. This may not be because empathy is not an important contributor to embarrassment ratings per se, but because we actually need to consider audience empathy data. Unfortunately this was not possible from the current data. Because feedback was given to presenters, and in order to keep this anonymous, audience members were not identified. Therefore there was no record of audience levels of EP, expression or empathy. Thus the data from Study 4 cannot address whether audience empathy affected embarrassment ratings.

So it appears that the most important factor when rating embarrassment levels is monitoring other peoples' reactions. For presenters, this means that EP skills need to be highly developed in order to assess audience reactions. In contrast, audience members rely on monitoring presenters' reactions, which are displayed most clearly by the degree to which they can express themselves.

Researchers have for a long time puzzled over the discrepancy between people's own perceptions and others' perceptions of them. It is possible that EP may mediate between the two helping to account for this difference. An analysis conducted on the data from Study 4 correlated presenters' self-report scores (EP, expressivity and empathy) with the difference between presenters embarrassment ratings and audience embarrassment ratings. EP was the only measure to correlate with the difference scores ($r = -0.36$, $p < 0.05$). Specifically, for presenters with high EP there was a significantly smaller discrepancy between presenters and audience embarrassment ratings than for presenters with low EP. The suggestion that EP acts as some kind of mediating variable is treated with caution due to its limitations: EP is only represented by presenter scores and where there is only one score for presenters, there are many scores from audience members resulting in unbalanced data for the type of analysis performed. Consequently, these data were not included in the main analyses, but the suggestion that EP may account for the difference between people's perceptions of themselves and other's perceptions of them would be worth investigating in future research.

The method used in Study 4 had its limitations. First, the embarrassment ratings may have been influenced by practice effects and audience members' attention was specifically directed towards the presenters' emotions. Second, the data did not

provide sufficient level of detail in order to determine the specific information audience members were using to rate embarrassment in others. Third, the data provide no evidence regarding observers' ability to distinguish embarrassment from related states such as shame. Also we could not know how embarrassment was being expressed.

Nevertheless, the study did advance knowledge of interpersonal perceptions of emotion in a naturalistic setting. Furthermore, participants were provided with some useful feedback about internal and external judgements of embarrassment. Wider dissemination of these findings could benefit many people who, for a multitude of reasons, experience feelings of embarrassment in their day-to-day lives.

Previously, we have looked at EP using questionnaire-based methods. The longitudinal studies showed that the measure was reliable, useful and had predictive validity, particularly over practical performance. The work was criticised, however, for employing self-report rather than objective measures. Study 4 used a quasi-experimental design to look at the effects of EP in a natural setting, further investigating the fact that it may influence practical performance. Indeed, EP proved to play an important role in interpersonal perceptions of embarrassment, but still left unanswered is whether EP is important in the moment-by-moment regulation of behaviour. The following Chapter presents a framework in which to investigate the detailed behavioural effects of EP.

Chapter 7

The contribution of emotional perception to attentional bias research

The second part of this thesis used a quasi-experimental design to investigate the effects of EP in the social environment. This third part takes this a stage further using a series of studies to investigate the theoretical influence of EP in actual moment-by-moment regulation of behaviour.

Most emotion research has used attention to look at the detailed effects of behaviour. EP involves the detection of affective material within the environment, so it is possible that attention towards emotionally meaningful stimuli may be mediated by EP. This section of the thesis uses the attentional bias framework in order to consider the effects of EP on behaviour. The investigation of attentional biases for threat and other types of emotional stimuli has concentrated largely on anxiety. However, it is important to describe this research as it provides a number of ways in which to consider the behavioural effects of EP. Therefore, it is necessary to first give an overview of this research area, particularly the various methodologies employed, before describing the series of studies. This review is selective, particularly when describing cognitive theories of anxiety.

This Chapter outlines the background of attentional bias research; describes two of the major cognitive theories of anxiety; considers the various methodological approaches used in attentional bias research; discusses recent experimental findings; considers the effects of time courses; looks at the role of depression in attentional bias and suggests the role that EP may play in this area of research. The purpose of this is to outline the background and rationale for the studies discussed in Chapters 8 and 9.

General superiority of threat stimuli

The attentional system plays a vital role in detecting and monitoring environmental and internal stimuli which are used to direct and organise behaviour. There is a clear evolutionary advantage to a species that can respond rapidly to the presence of potential threat. Threat can be dealt with more efficiently if the limited capacity processing resources of the individual can be rapidly brought to focus on the relevant stimuli. There is considerable evidence to suggest that people preferentially

attend to negative/threatening stimuli in the environment, which is generally termed the *threat* hypothesis. Pratto & John (1991) proposed that people automatically evaluate the "goodness" or "badness" of stimuli so that attention is directed to negative information.

Many research paradigms have relied on word stimuli, which have been criticised in terms of ecological validity and a whole class of lexical effects such as frequency, age of acquisition and orthography. Thus there has been a growing recognition of the need for more ecologically valid, informative stimuli. One such class of stimuli is facial expressions, a form of social communication which is argued to be innate and particularly good at communicating threat (e.g., Öhman, 1993). Angry faces appear to be particularly attention grabbing for infants (Oatley & Jenkins, 1996), and similar results have been found with adults who could detect an angry face in a crowd more efficiently than a happy face in a crowd (e.g., Fox, Lester, Russo, Bowles, Pichler & Dutton, 2000; Gilboa-Schechtman, Foa, & Amir, 1999; Hansen & Hansen, 1988; Öhman, Lundqvist, & Esteves, 2001). Neurophysiological evidence (e.g., LeDoux, 1995) has shown that a direct pathway leading from the sensory thalamus to the amygdala allows mammals to respond defensively to an ambiguous stimulus before the object is identified as either threatening (e.g., a snake) or innocuous (e.g., a branch). It has even been proposed that humans are "hard-wired" for the recognition of anger or threat from fairly "low-level" sources of information (Öhman, 1993). Mogg, McNamara, Powys, Rawlinson, Seiffer, & Bradley (2000) concluded that although the relative effects of positive and negative information on attracting attention in nonclinical subjects have to some extent been rather mixed, all individuals orient to stimuli that are judged to be significantly threatening. Although they found some evidence to suggest that happy faces may be processed in a similar way to angry faces, Fox, Russo, & Dutton (2002) support the claim that there is "something special" about angry faces and that evolution found a way to efficiently process and respond to threat signals (e.g., an angry face) in the visual environment.

There is, however, an alternative to the threat hypothesis which is known as the *emotionality* hypothesis. This theory suggests that positive emotional stimuli might capture attention to the same extent as negative emotional stimuli. In contrast to the threat hypothesis, which predicts that threatening (i.e., angry faces) will have the most powerful effects on attention, the emotionality hypothesis predicts that positive (i.e., happy faces) will have the same effect.

Fox et al. (2000) directly compared the threat and emotionality hypotheses using the face in the crowd technique (see face in the crowd paradigm section below for a description). According to the threat hypothesis, an angry face should be detected quicker than a happy face in a neutral crowd, and displays of "all angry"

faces should hold attention, thus be responded to slower than either "all happy" or "all neutral" displays. According to the emotionality hypothesis, there should be no difference between locating an angry or happy face in a neutral crowd, and "all happy" displays should result in slower responses than "all neutral" displays and be comparable to "all angry" displays. The results supported the threat rather than the emotionality hypothesis. People were faster when locating a different angry face compared to a happy face in a neutral crowd, and displays of "all angry" faces were responded to slower than "all happy" faces suggesting that angry faces held attention for longer than happy faces.

Other studies have found support for a general emotionality effect (e.g., Bradley, Mogg, White, Groom, & de Bono, 1999; Fox et al., 2002; Gilboa-Schechtman et al., 1999; Mackintosh & Mathews, 2003; Martin, Williams, & Clark, 1991), but this does not seem to be consistent. More direct tests of the threat and emotionality hypothesis need to be conducted in order to cast light on the debate. This is one of the aims of the studies described in Chapters 8 and 9.

Individual biases for emotional information

Attentional bias for threat has been proposed to underly vulnerability to anxiety disorders (e.g., Mathews, 1990; Mathews, 1993; Mathews & MacLeod, 2002; Mogg & Bradley, 1998; 2003; Williams, Watts, MacLeod, & Mathews, 1988; 1997). Individuals with a tendency to adopt a threat-vigilant style will have an increased perception of danger in the environment, thus will experience anxiety more often than those who show no such attentional bias. Vulnerability to anxiety is proposed to be associated with different processing styles that are elicited by stressful events (e.g., Mathews & MacLeod, 2002; Mogg & Bradley, 1998). In vulnerable individuals, a stressful event, such as a house move or divorce, is more likely to elicit a "vigilant" processing style, where attention is grabbed by relatively mild threatening cues. Thus, these individuals will be exposed to a plethora of information about potential dangers, resulting in increased anxiety. In less vulnerable individuals, the same event may be insufficient to trigger a shift from the default "avoidant" mode, in which threatening information is ignored. Consequently, it is the type of processing style that is triggered by events which causes vulnerability to anxiety, rather than biases being merely a by-product of emotional variations. Mathews & MacLeod (2002) conduct a comprehensive review of the nature of these processing styles and discuss new data on the experimental induction of attentional and interpretive biases. They conclude that their review represents the most convincing evidence to date that specific processing biases can play a *causal* role in the development of vulnerability to anxiety.

It is important to consider that attentional biases may not be specific to anxiety, but that other variables may also have an influence over such processes. Emotionality, for example, has been identified as being a potential confound of attentional bias research (Martin et al., 1991), and has subsequently been included in studies investigating attentional biases in anxiety (Reidy & Richards, 1997a; 1997b). Indeed, Reidy & Richards (1997a) found an interaction between anxiety and emotionality for negative words which just failed to reach significance. In this study, threatening and matched positive words were classed as 'emotional', whereas the non-threatening and matched positive words were classed as 'non-emotional.' Extending this idea, it is not only the emotionality of the *stimuli* which may effect results, but *individual* levels of emotionality may also influence attentional bias research.

EP, for instance, may have an effect on attentional focusing to emotionally-meaningful stimuli. People high in EP are presumably better at processing all types of emotional information, which is likely to influence responses on attentional tasks. As a result, they are likely to successfully identify whether a stimulus represents a potential threat or not. Also, individuals with high EP may be more interested in emotional material and focus on it for longer. In contrast, individuals with low EP tend to be less skilled at surveying the emotional landscape. They may therefore respond more quickly to angry faces on attentional tasks, as they have difficulty deciding whether threat is real or imagined. Additionally, they may not be interested in maintaining attention on emotional stimuli. Like individuals with high anxiety, low EP may lead to an accentuation of the normal threat bias, albeit for different reasons.

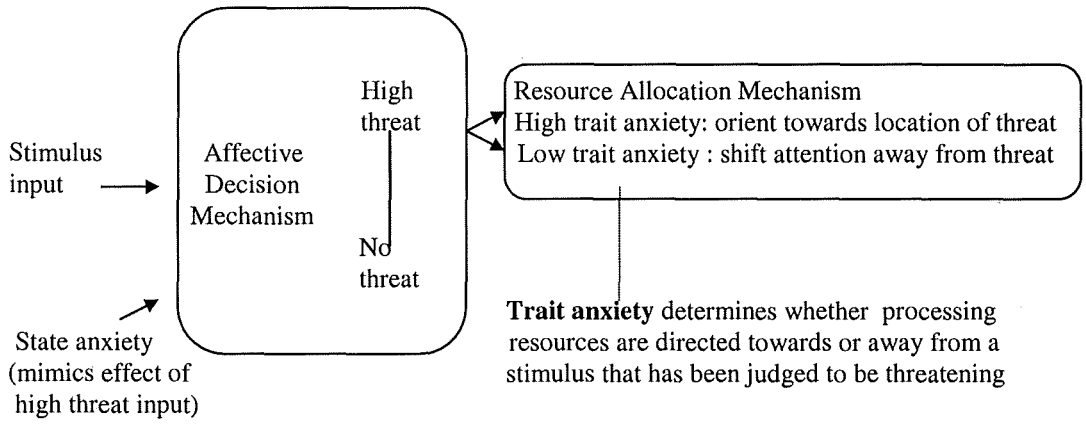
In terms of the relative contribution of the threat and emotionality hypotheses, the general emotionality effect may be more apparent for EP, which involves surveying all types of emotional information. Anxiety effects may just occur for threatening stimuli.

Cognitive theories of anxiety

1) The interaction hypothesis

Williams et al. (1988; 1997) proposed that two mechanisms were responsible for the preattentive and attentional bias to threat in anxiety: the Affective Decision Mechanism (ADM) and Resource Allocation Mechanism (RAM); see Fig 7.1.

Fig 7.1 The interaction model of anxiety.

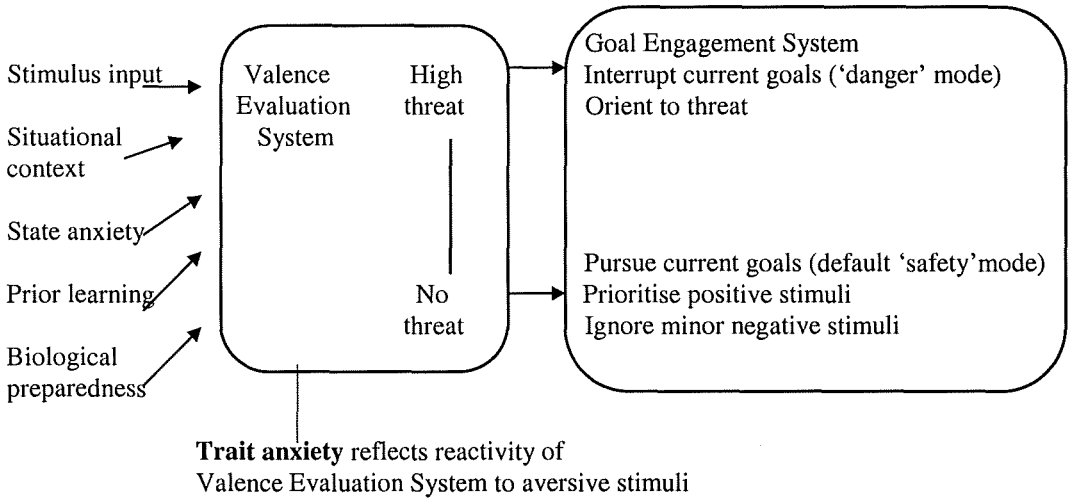


The ADM, influenced by state anxiety and stimulus threat input, assesses the threat value of environmental stimuli and passes this information on to the RAM, affected by trait anxiety, which directs attention towards or away from threatening stimuli. As threat inputs from the ADM increase, high trait anxious individuals should become more vigilant, and low trait anxious individuals more avoidant, of threat. So, according to this theory, attentional biases are an *interactive* function of trait-anxiety and state anxiety (threat input).

2) The cognitive-motivational theory

Mogg & Bradley (1998) have criticised the interactive hypothesis on the grounds that it makes counterintuitive predictions for low trait anxious individuals. According to the interactive theory, as threat stimuli increases, low trait anxious individuals become more avoidant of threat. However, in order for the attentional system to function effectively, attention should always be directed to real danger or severe threats. Therefore, low trait anxious individuals should exhibit greater vigilance for high rather than mild threat stimuli. Consequently Mogg & Bradley (1998) proposed an alternative theory to account for attentional biases in anxiety. This theory is compatible with biological models of anxiety and has been influenced by theories of personality, emotion and cognitive neuroscience. The cognitive-motivational theory consists of two main functional systems: a Valence Evaluation System, which is responsible for the appraisal of stimulus threat value, and a Goal Engagement System, which directs behaviour towards external stimuli; see Fig 7.2.

Fig 7.2 The cognitive-motivational model of anxiety.



In contrast to the interactive hypothesis, the cognitive-motivational theory proposes that trait anxiety influences the appraisal of stimulus threat value, rather than the direction of attentional bias, so all individuals, including those with low trait anxiety, should be more vigilant for high rather than mild threat stimuli. This suggests that the relationship between stimulus threat value and attentional bias is curvilinear. Emotionally neutral stimuli that have no threat value should evoke no attentional bias. However, when stimuli are appraised as being mildly aversive and having a low subjective threat value, there may be a tendency to direct attention away from them (e.g., avoidance of threat words or faces in low anxious individuals, Bradley, Mogg, Millar, Bonham-Carter, Fergusson, Jenkins, & Parr, 1997; MacLeod, Mathews, & Tata, 1986). This avoidance of trivial negative stimuli in the environment may serve to maintain attention on current goals and also assist in mood regulation, (i.e., to maintain a positive mood). However, as the subjective appraisal of threat value increases (due to increasing threat value, or trait anxiety) then attention is increasingly likely to be allocated towards it. For a detailed discussion of cognitive and biological formulations of anxiety, see Mogg & Bradley (1998).

To summarise, at this stage it is difficult to conclude which of these two approaches offers the best explanation for attentional biases in anxiety. Few studies have directly tested the two theories against one another, but one that did found support for the cognitive-motivational theory (Mogg et al., 2000). More research is needed before we can decide where anxiety has its effect in attentional processing.

Different methodological approaches to examining attentional biases

A variety of different methods have been used to examine attentional biases for threat. Earlier studies used words as threat stimuli. Several researchers have used the modified Stroop task. Typically, highly anxious individuals display longer reaction times to name the colours of threatening words (e.g., danger) than to name neutral words (e.g., chair), compared to non-anxious controls (Richards & French, 1990; Richards, French, Johnson, Naparstek, & Williams, 1992; Richards & Millwood, 1989). However, although the Stroop task has been used to demonstrate attentional bias for a wide range of anxiety disorders, it has lead to a rather mixed pattern of results (e.g., reviews by Williams, Mathews, & MacLeod, 1996), with some studies even suggesting that increasing threat inputs may suppress rather than enhance the Stroop interference effects (e.g., Mathews & Sebastian, 1993). With regard to non-clinical studies, attentional biases for threat-related words are often not found in individuals who have high levels of trait anxiety within the normal population unless they are under stress (Mogg & Bradley, 2003). The emotional Stroop task has given rise to interpretative difficulties: anxious individuals' longer reaction times to threat-related words have been interpreted in terms of attention being preferentially allocated to the threat content, interference at the response stage or even momentary elevation in arousal disrupting performance and leading to slower colour naming. The task has also been classified as being an impure measure of attention, as it may involve post-attentional processing of the stimuli (Mogg et al., 2000).

Interpretative biases have also been investigated in anxiety. When presented with ambiguous stimuli, highly anxious individuals tend to provide a threat rather than neutral interpretation. For example, Eysenck, MacLeod, & Mathews (1987) presented non-clinical participants high and low in trait anxiety with threat/neutral homophones (e.g., die/dye) in a spelling task. They found that high trait anxious participants tended to favour threat-related spellings compared to low trait anxious participants. This general finding was replicated by Mathews, Richards, & Eysenck (1989) using a clinically anxious sample. This interpretative bias for threatening information has also been found using ambiguous sentences (e.g., "the two men watched as the chest was opened"), where clinically anxious individuals tended to favour the threatening interpretations more than recovered anxious patients or normal controls (Eysenck, Mogg, May, Richards, & Mathews, 1991). Using a semantic priming paradigm, Richards & French (1992) presented ambiguous threat/neutral homographs to high and low anxious individuals. Each threat/neutral homograph (e.g., 'growth') was followed by either a threat-related associate (e.g., 'cancer'), a neutral associate (e.g., 'tall') or an unrelated word (e.g., 'wind'). There were three stimulus onset

asynchronies (SOAs) of 500 msec, 750 msec and 1250 msec. When the SOA was 500 msec, all participants showed priming (faster RTs to related than unrelated trials) for both meanings. At 750 msec, the only significant priming effect was for the threat-related meaning in the high anxiety group and a similar trend was found at 1250 msec. These methods, however, have been faced with similar interpretative difficulties and criticisms of response bias as in the Stroop paradigm.

Given the problems with these tasks, MacLeod et al. (1986) developed the dot probe paradigm, which provides a more direct measure of attentional biases. Typically, participants are presented with a series of word-pairs (one threat-related, one neutral), on a computer screen. Each pair is presented briefly and when it disappears, a probe (usually a small dot) is presented in the former location of one of the words. Participants are instructed to respond as quickly as possible to the dot probe. Research has shown that individuals with GAD are faster to detect probes which replace threat words than neutral words, in comparison with normal controls (Mogg & Bradley, 1998). Furthermore, evidence shows that normal individuals with high levels of trait anxiety show increased vigilance for threat words (Mogg et al., 2000). These results are consistent with an attentional bias favouring threat stimuli. The dot probe paradigm has advantages over the above paradigms in that it does not rely on interference effects and is independent of response bias, requiring a neutral response (button pressing) to a neutral stimulus (dot probe). It can therefore be concluded that the dot probe task is a 'purer' measure of attentional bias.

Attentional biases for emotional faces

The research paradigms described above have generally relied on *word* stimuli to investigate attentional biases in anxiety. This has been criticised on several grounds: First, single words are arbitary symbols which are not usually the source of threat in the environment making the stimuli not ecologically valid (Gilboa-Schechtman et al., 1999). Second, it is unclear whether familiarity or frequency of use may contribute to results that employ words as stimuli. Anxious subjects are likely to spend more time thinking about threatening events, and to describe themselves as fearful, anxious, etc. Thus they are more familiar with, and show higher frequency of use of words that relate to threat. This may account for attentional biases to word stimuli rather than threat value per se (Bradley et al., 1997). Third, single words have a relatively mild threat value, and so are not likely to be very informative about attentional biases for more highly emotional stimuli (Mogg & Bradley, 2003).

As a result of these criticisms, there has been a growing recognition of the need to use more informative, ecologically valid stimuli to examine attentional biases. Consequently facial expressions have been used in attentional bias studies. They are

not only more ecologically valid than words, which are indirect representations of social signals, but also avoid the many confounds associated with word stimuli (as discussed earlier).

Recent experimental findings using facial stimuli

Two main methods have been appropriated for investigating attentional biases: The dot probe task and face in the crowd paradigm. Findings from these two areas of research are discussed in the following sections.

Dot probe paradigm

A pictorial version of the dot probe task was used to investigate emotion-related biases in selective attention in non-clinical subjects (Bradley et al., 1997). On each trial, an emotional photograph (either threatening or happy) was paired with a neutral photograph of the same person and presented simultaneously on a screen for 500 msec. Following the presentation of the face pair, a dot probe appeared in the former location of one of the faces and participants were required to press the appropriate response button (left or right) to indicate the position of the probe. The results showed evidence of an emotional-congruent attentional bias (i.e., Dysphoric Group x Face Valence interaction effect). Particularly, non-dysphoric individuals (i.e., those with low levels of anxiety and depression) showed an attentional bias away from threatening faces, relative to happy or neutral faces, in comparison with dysphoric individuals. However, significant intercorrelations between the anxiety and depression measures made it unclear whether avoidance of threat faces was associated with low levels of anxiety, depression, or a common underlying factor such as negative affect.

A subsequent non-clinical study included two exposure durations for the face stimuli (500 and 1250 msec) to examine the time course of the attentional bias (Bradley, Mogg, Falla, & Hamilton, 1998). Results showed that high trait anxious individuals were more vigilant for threat faces relative to happy faces across both exposure durations. This finding of vigilance for angry faces in normal individuals with increased levels of trait anxiety was replicated using only the 500 msec exposure duration (Mogg & Bradley, 1999a).

Mogg et al. (2000) evaluated the differential predictions from the two cognitive theories of anxiety outlined above in a non-clinical sample. To recap, the two theories make opposite predictions regarding the relationship between stimulus threat value and attentional biases in low trait anxiety. According to the cognitive-motivational view (Mogg & Bradley, 1998), both high and low trait anxious individuals should show greater vigilance for high rather than mild threat stimuli. In

contrast, according to the interaction hypothesis (Williams et al., 1988; 1997), high trait anxious individuals should become more vigilant, and low trait anxious individuals more avoidant of threat, as stimulus threat value increases. Two experiments were conducted to examine these different predictions by manipulating stimulus threat value. High threat (e.g., murder victims, mutilated bodies) and mild threat (e.g., soldier holding gun) pictorial scenes were paired with non-threat (e.g., person playing piano) pictures presented in a dot probe detection task. The results from both experiments indicated a significant main effect of stimulus threat value on attentional bias. There was increased vigilance (or reduced avoidance) of threat, as threat value increased. This main effect was significant even in low trait anxious individuals, consistent with the cognitive-motivational view. In line with much of the previous research using the dot probe paradigm, these results reflected initial orienting to threat as the pictures were presented for 500 msec.

The above studies examined attentional biases for faces in non-clinical anxiety, but similar research has been conducted to see whether such biases exist in clinical anxiety. For example, attentional biases for faces in generalised anxiety disorder were investigated using the dot probe task with threatening, happy and neutral faces shown for two exposure durations: 500 and 1250 msec (Bradley et al., 1999). Anxious patients showed greater vigilance for threat faces relative to neutral faces, compared with normal controls. This effect occurred across both exposure durations. Anxious patients also showed increased vigilance for happy faces, but this was only significant in the second half of the task. This suggests that the threat bias may be mediated by relatively automatic processes involved in initial orienting of attention, whereas the bias for positive faces in clinical anxiety may depend on later strategic processes.

Using the dot probe paradigm, Mogg & Bradley (1999b) examined whether attentional bias for threat does indeed operate in early pre-attentive processes, i.e., even when the stimuli are presented outside awareness. Pairs of faces (threat or happy) and neutral, were briefly displayed (for between 14 to 34 msec), they were then masked, and the probe then appeared after the offset of the mask. The results indicted a preference to orient attention towards the location of the masked threat, rather than the masked happy faces, consistent with a pre-attentive bias for threat faces. This effect was particularly apparent when the threat face and probe were presented in the left visual field, which is in line with research indicating a right hemispheric dominance in threat processing (e.g., Christianson, Saisa, & Silfvenius, 1995). Furthermore, the pre-attentive bias for threat faces was greater in high rather than low trait anxious individuals.

A further experiment Mogg & Bradley (2002) examined whether the anxiety-related bias for masked threat faces could be replicated, and assessed the relationship

between the pre-attentive bias and measures of trait and social anxiety. The results indicated that anxious individuals were faster to respond to probes replacing masked threat than neutral faces, and that this pre-attentive bias for threat appeared to be primarily a function of high levels of social anxiety and social avoidance, rather than trait anxiety. The bias was also more apparent when threat faces were presented in the left visual field, which is compatible with the previous findings (Mogg & Bradley, 1999b) and once again suggests right hemisphere dominance in processing of threat.

In summary, anxiety levels consistently seem to influence dot probe results with highly anxious individuals showing a bias towards threat stimuli. In terms of the cognitive theories introduced earlier, initial evidence seemed to offer support for the interaction hypothesis, but more recently support has been shown for the cognitive-motivational hypothesis. Further research is required to distinguish between these two approaches.

In terms of EP, as outlined earlier, if individuals with high EP are better at surveying the emotional scene, then they will be unlikely to demonstrate a threat bias. On the other hand, individuals with low EP, who may be less competent at processing emotional information, would be expected to demonstrate a threat bias. These hypotheses are subsequently tested in Chapter 8.

Face in the crowd paradigm

The second major paradigm that has been used to investigate attentional biases for threat faces is the face in the crowd technique; which has been argued to be more ecologically valid than the dot probe task (e.g., Byrne & Eysenck, 1995). In this task, participants are presented with several faces. On some trials, all faces have identical emotional expressions, whereas on other trials one ('target') face displays a different emotion from the rest of the "crowd". Participants are required to detect the presence or location of the target face as quickly as possible (e.g., an angry face in a happy crowd, or a happy face in an angry crowd). The target face is said to "pop-out" of the display and search is considered to be automatic if search times do not increase substantially with increasing numbers of distracters in the display. Search slope is generally calculated by dividing the mean increase in overall response time by the number of additional faces. For example, if response time increases from 300 msec for a 4-item display to 400 msec with a 9-item display, the search slope would be 20 msec/item. Search slopes of less than 10 msec per face are generally thought to demonstrate automatic or pre-attentive search, whereas search slopes of more than 10 msec per face are thought to reflect serial or controlled visual search (Fox et al., 2000).

Hansen & Hansen (1988) required participants to determine whether displays of four and nine faces were all the same or whether one face was different from the rest. They found that an angry face in a happy crowd was detected significantly faster than a happy face in an angry crowd. Interestingly, an angry face was detected as rapidly among four happy faces as among nine happy faces; whereas a happy face took longer to find among nine angry faces than among four angry faces. The authors concluded that facial displays of threat were detected automatically, whereby threat stimuli are more prone to 'pop-out' from the visual scene and capture attention, compared with positive stimuli. In contrast, detection of a discrepant happy face required a serial and linear search.

Fox et al. (2000) made two major criticisms of the Hansen & Hansen (1988) study. First, differences in reaction times between detecting an angry and happy target face may have resulted because angry distracters hold attention for longer than happy distracters, thus participants took longer to respond to a happy face in an angry crowd. This indicates that angry faces do still hold attention, but does not present clear evidence that angry faces 'pop-out' of the crowd per se. The authors propose that a better method would be to examine reaction times to angry and happy target faces among neutral crowds. Second, there may have been inadvertent visual cues (such as a dark spot on the chin of the angry face) present in the stimuli used by Hansen & Hansen. Indeed, Purcell et al. (1996; cited in Fox et al., 2000), removed these artefacts by using gray scale versions of the same stimuli used by Hansen & Hansen (1988) and could find no evidence for 'pop-out' of angry faces.

The problems of controlling for inadvertent shadows and other visual features when using real faces can be overcome by using schematic faces. Research has shown (e.g., Fox et al., 2000) that emotional expressions are readily recognised from simple eyebrow and mouth line drawings. In consideration of these methodological criticisms, Fox et al. (2000) re-evaluated the face in the crowd effect in a series of five experiments. The combined results of the five experiments confirmed the existence of the face in the crowd effect using simple schematic facial expressions. Schematic angry (or sad - Experiment 5) faces tend to: (1) hold visual attention in same displays resulting in slower responding, and (2) speed up detection time when they appear among three (or seven) neutral or happy distracter crowds, indicating fast and efficient detection of threat. Furthermore, these results are unlikely to be confounded by some low-level visual feature of the display because the pattern disappeared when the face displays were inverted (Experiment 3) or when the mouth was presented in isolation (Experiment 4). Although these results do not strictly support the view that angry faces 'pop-out' of a crowd automatically (as search slopes were always serial, i.e., above 10 msec per item), they do support the view that detection of threat is faster and

more efficient than the detection of positive emotional expressions. Initially, the authors were interested in testing for differences in anxiety levels. However, this factor did not interact with face detection times in any of the five experiments and was therefore not discussed further.

A similar set of studies Öhman et al. (2001), using the face in the crowd-technique, generally found support for Fox et al's (2000) study by establishing a threat advantage with schematic faces. Discrepant threatening faces were more quickly and accurately found among both neutral and emotional distractor faces than discrepant friendly faces (Experiments 1, 3, 4, 5), for crowds of different sizes (Experiments 2 and 3), and for both upright and inverted stimulus displays (Experiment 4). In contrast to Fox et al. (2000), threatening faces were more effectively located than sad or scheming faces (Experiment 5), suggesting the effect was specific to threat rather than dependent on general properties of stimuli such as negative valence or uniqueness. This difference may be due to the fact that the schematic faces were slightly different across the two studies, or as suggested by Fox et al. (2000), certain individuals may interpret ambiguous faces in "the worst possible way" (i.e., ambiguous sadness = anger). Furthermore, there was no evidence of enhanced dwell time for "same" threatening faces in the current study, which again is in contrast to Fox et al's study. Overall, however, the advantage for detecting threatening stimuli was remarkably consistent, and the only condition that did not produce a threat advantage was the short (1 sec) exposure with emotional distractors in Experiment 1. The authors were not testing for differences in anxiety levels.

Other studies, however, have found a significant relationship between anxiety and the threat superiority effect using the face in the crowd technique. Byrne & Eysenck (1995) reported that high trait anxious individuals were faster in detecting the location of angry faces in happy crowds than low trait anxious individuals. Mogg & Bradley (1998) describe a similar study they conducted, using an array of 8 rather than 12 faces, where the threat superiority effect was observed for all participants, and that this effect was more apparent in high than low state anxious individuals.

Gilboa-Schechtman et al. (1999) examined the hypothesis that individuals with generalised social phobia (GSPs), like other anxious individuals, would exhibit attentional bias towards threat stimuli. Using the face in the crowd technique, GSPs and nonanxious controls (NACs) detected an angry, happy, neutral or disgust target face in a crowd of 12 distracter photographs. Results indicated that all participants showed an attentional bias for angry faces than for happy faces in a neutral crowd, but this was far more pronounced for GSPs. In contrast to previous studies using state/trait anxious individuals, GSPs were more distracted (i.e., slower) than NACs when making decisions for angry and happy versus neutral crowds, suggesting general

sensitivity to emotional expression. This is in line with clinical observations suggesting that GSPs concern with others' emotional reactions to their actions is not limited to negative reactions only. Also, because it is common for GSPs to fear being ridiculed, they may have interpreted a crowd of happy faces as threatening. Finally, GSPs were faster at detecting anger than disgust expressions when presented in a neutral crowd; NACs did not show this pattern.

In summary, anxiety levels do seem to influence face in the crowd results, but findings are not always consistent. Consequently, there is no concluding evidence at this point to distinguish between either of the cognitive theories introduced earlier.

In terms of EP, according to the hypotheses outlined earlier, individuals with low EP may be expected to show a bias for angry faces. When using the face in the crowd paradigm, this will be reflected in quick detection of a single angry face in a neutral crowd, or maintaining attention on a display of all angry faces. These hypotheses are subsequently tested in Chapters 8 and 9.

Time courses of attentional biases

An important consideration when using these paradigms concerns the time course of attentional biases. First, it has been questioned whether the frequently used exposure time of 500 msec is actually a valid measure of initial orienting to threat. It could be that even this short exposure time may allow for shifts of attention. Consequently, individuals may initially orient to the neutral stimulus and then shift attention to the threat stimulus, showing an apparent bias to threat.

To examine this issue, Bradley, Mogg, & Miller (2000) monitored direction of gaze while participants performed a dot probe task with face stimuli. Each trial consisted of the presentation of an emotional face (threatening, sad or happy) paired with a neutral facial expression of the same person, for 500 msec. Participants then had to make a manual response to a dot probe. There were two measurements of attentional bias: (1) manual reaction times to probes (covert orienting), and (2) direction of initial eye movement towards or away from the emotional face (overt orienting), occurring at around 250 msec following the presentation of the face pair. The results showed evidence of anxiety related attentional-biases. In particular, the manual reaction time data showed that higher state anxiety was associated with greater vigilance for threat, which appeared to be independent of Beck Depression Inventory scores. This effect was concordant with the other attentional bias measure of initial eye movement. Where participants made eye movements to negative faces relative to positive faces, they showed a corresponding vigilance for threat in their reaction time data. Thus, from the results of this dot probe task, it was concluded that reaction time

responses following an exposure time of 500 msec are valid in reflecting the direction of initial orienting to emotional stimuli.

Mogg & Bradley (2003) discuss a further study of eye movements to emotional faces in clinical anxiety. The task employed a similar methodology to the experiment described above, but faces were presented for 1000 msec. In contrast with the previous study, no correspondence was found between the two attentional bias measures of manual reaction time and initial eye movement. This suggests that reaction time data may not be accurate about the direction of initial orienting when longer exposure times (such as 1000 msec rather than 500 msec), are used for facial stimuli in the dot probe task.

The second issue concerning the time course of attentional biases is the extent to which anxiety influences all aspects of selective attention. Research suggests that the attentional system is not unitary (e.g., Allport, 1989; LaBerge, 1995, cited in Mogg & Bradley, 1998). Posner & Peterson (1990; cited in Bradley et al., 1998), proposed that three distinct subsystems underlie orienting: attentional shifting, engagement and disengagement. There is accumulating evidence that anxiety is associated with a bias in pre-attentive processes in initial orienting of attention to threat (e.g., words/faces presented for exposure times of 500 msec or less). However, an important question is what subsequently occurs. Three main possibilities have been suggested: The first hypothesis suggests a "vigilance-avoidance" pattern of processing where, following initial orienting to threat, anxious individuals then divert their attention away from the threat stimulus in order to minimise discomfort. This pattern of bias may well contribute to the maintenance of anxiety states. Rapid detection of a threat stimulus, which is actually harmless, followed by avoidance, is likely to interfere with habituation or objective evaluation thus contributing to a failure of emotional processing. Another, perhaps more traditional view, is that anxious individuals show a bias throughout the cognitive system. Once their attention has focused on a threat stimulus, they have difficulty disengaging it. A third suggestion is that anxiety-related bias only operates in initial vigilance to threat and there is no anxiety-related bias in processes responsible for sustained attention (Mogg & Bradley, 1998).

Bradley et al. (1998) investigated the time course of attentional biases for facial expressions (threat, happy and neutral) in high and low trait anxious individuals. The face pairs were presented at two exposure durations, 500 and 1250 msec. Participants were then required to press one of two keys to indicate the *type* of probe (: or ..) that appeared, rather than just indicating the presence of the dot probe. This forced-choice task has the advantage of encouraging attention to be allocated equally to both halves of the display and making sure each trial was responded to. The results provided clear evidence of an attentional bias for threatening faces, but not emotional faces in

general, in high trait anxiety. This result was significant at the 500 msec exposure time, but only a non-significant trend at the 1250 msec exposure.

Mogg & Bradley (in preparation) examinined the time course of attentional responses to fear-provoking stimuli in individuals with phobia. Photographs of spiders were presented in a dot probe task at three different exposure times: 200, 500 and 2000 msec. Spider-phobic individuals were found to be more vigilant for the phobic stimuli at 200 msec, compared to non-phobic controls. Neither group showed a bias for the phobic stimuli at longer exposure times. These results suggest that anxiety-related attentional biases for threat are more robust at shorter stimulus durations reflecting pre-attentive orienting. This is in line with Bradley et al's (1998) results where differences between high and low trait anxious individuals were clearly significant at 500 msec exposure time, but were only non-significant trends at the 1250 msec exposure.

The studies described above, however, found no avoidance of threat at the longer stimulus durations. One possible explanation is that avoidance strategies may only be apparent for highly emotional stimuli which induce an aversive mood state, and the stimuli used in these studies did not elicit sufficient anxiety to reveal the hypothesised vigilance-avoidance pattern (Mogg & Bradley, 2003).

Taking these suggestions into consideration, Mogg, Bradley, Miles, & Dixon (in press) conducted a dot probe study using high threat pictorial scenes (e.g. person being attacked with knife; mutilated corpse) paired with neutral scenes, in which the stimulus pairs were presented for either 500 or 1500 msec. The main hypothesis was that high anxious individuals will show enhanced initial orienting to high threat scenes (i.e. vigilance at 500 msec), but avoidance of high threat at the longer exposure duration of 1500 msec. As the high threat pictures included scenes depicting attack, injury, death and mutilation, blood-injury (BI) fear as well as trait anxiety was assessed, as BI fear may be a more specific predictor of attentional biases for these stimuli rather than general vulnerability to anxiety. The results showed that high trait anxious individuals were more vigilant for high threat scenes at the shorter exposure duration (500 msec). Furthermore, when the sample was re-allocated to groups on the basis of BI fear scores, individuals with high BI fear showed vigilance for high threat scenes at 500 msec, and avoidance of them at 1500 msec, which is consistent with expectation from the vigilance-avoidance hypothesis.

In contrast, there has been a growing body of evidence suggesting that highly anxious individuals take longer to *disengage* from threat stimuli. Traditional probe-detection tasks do not enable us to determine whether attention is directed from one class of stimulus or another. Both locations are task relevant, and presentation times are relatively long (often 500 msec), so participants may attend alternately to both

locations and then continue to dwell on threat-related stimuli once they have been detected. Similarly, in the face in the crowd technique, stimulus presentation times are relatively long so may allow for multiple shifts of attention across the visual scene. It is not feasible, therefore, to distinguish between differences in initial orienting and differences in attentional disengagement using these methods (Fox et al., 2002). Due to these limitations, a new method, known as the cue-validity paradigm, has been developed to investigate the ability to disengage attentional resources (or dwell-time) from threatening material. A threat-related or neutral cue is presented alone for a very brief period in one of two possible locations. A target can then appear in either the same (valid trial) or in a different (invalid trial) location. The logic is that if attentional dwell-time increases in highly anxious individuals for threat-related stimuli, then they should be slower in detecting a target on invalid trials following a threat-related cue, relative to a positive or neutral cue.

The hypothesis that angry faces would lead to enhanced dwell-time (delayed disengagement), especially in high trait anxious individuals was partially supported in three experiments (Fox et al., 2002). In Experiment 1, highly anxious individuals took longer to disengage from angry *and* happy faces relative to neutral as reflected by increased responses times on invalid trials. Response times on invalid trials were equivalent across the different cue types for low trait anxious individuals. Thus there was delayed disengagement for emotionally valenced faces (positive or negative) in high, but not low, trait anxious individuals. In Experiment 2, *all* participants responded slower to angry faces on valid trials relative to either happy or neutral faces. This supports the notion that angry faces have a special significance for all individuals and in contrast to Experiment 1, attention is not necessarily disrupted by faces expressing positive as well as negative emotions. Also, contrary to Experiment 1, there was no anxiety-related effect for angry faces. In Experiment 3, individuals with high, but not low, trait anxiety had difficulty disengaging from angry and jumbled facial stimuli. These results support the general hypothesis that threat or ambiguous cues can disrupt attention for individuals with high trait anxiety. However, it was noted that the threat value of the jumbled face may be the key feature rather than the ambiguity as it was unwisely constructed from an angry face. Overall, these results add tentatively to the growing evidence that individuals (especially when they are highly anxious) take longer to disengage attentional resources from threatening information such as angry facial expressions (e.g., Compton, 2000; Fox, Russo, Bowles, & Dutton, 2001) and threatening pictures (Yiend & Mathews, 2001).

To summarise, it appears that attentional bias for threat in anxious individuals is consistently evident at shorter stimulus exposures, but the tendency to maintain attention on threat material may diminish over longer periods. If anxiety-related

vigilance for threat diminished entirely over time, this would be consistent with hypothesis three outlined above where trait anxiety only influences initial orienting processes and does not systematically influence other aspects of attention. However, more recent evidence, introduced above, suggests that this is not the case and that highly anxious individuals have difficulty disengaging from threat related stimuli. Further supporting evidence, using new techniques such as the cue-validity paradigm, is required to more conclusively address the debate over time courses of attentional biases. At this stage, however, there appears to be more evidence in support of the disengagement model than the vigilance-avoidance hypothesis.

Attentional biases in depression

One debatable issue is whether depression is associated with an attentional bias for negative information that corresponds to the bias found in anxiety. Anxious people dwell (if only for a short time) on threatening stimuli and perceive threat in ambiguous events. Although we do not know yet if depressed people show delayed dwell times, their ruminative styles qualify as prolonged attention to negative thoughts, and they do evidence negative selectively in initial interpretations. Continual habits to see the world in negative ways predict depressive symptomology later on (Hertel, 2002). Similarly, trained habits of interpretation can give rise to anxious states and rumative tendencies predict future symptoms of anxiety as well as depression. Anxiety and depression overlap cognitively and may therefore be expected to show similar patterns of attentional bias.

Several studies have failed to find evidence of biases for negative information in clinical depression using Stroop and dot probe tasks (e.g., Bradley, Mogg, Millar, & White, 1995; Mathews, Ridgeway, & Williamson, 1996; Mogg & Bradley, 1998). These results cannot be attributed to methodological difficulties with the tasks, as in each study, clinically anxious individuals without depressive disorder did show evidence of a bias for negative information. It should be noted, however, that these tasks involve *selection* between different stimuli. While these studies seem to be fairly consistent in failing to show evidence of pre-attentive biases, other studies have found such biases in depressed individuals. They have tended to use relatively long exposure durations or included a priming condition. For example, depression-congruent biases have been found at 730 msec on the 'colour perception' task, and at 1000 msec on the dot-probe task (McCabe & Gotlib, 1995; Mogg, Bradley & Williams, 1995; cited in Mogg & Bradley, 1998). Furthermore, depressed individuals have shown significantly greater priming of depression-related information, even when it is presented so briefly that they could not identify its content (Hertel, 2002).

Together with the considerable evidence of depression-related biases on explicit memory tasks (e.g., Blaney, 1986; cited in Mogg & Bradley, 1998), these findings suggest that depression is associated with biases in both automatic and strategic aspects of memory. It may be that anxiety is involved in initial orienting of visual attention to threat stimuli, whereas depression may be associated with a bias in later aspects of processing. Alternatively, depression may not be associated with the selection of stimulus information from the visual scene and in initial orienting, as assessed by certain attentional tasks. If this is the case, perhaps the key is to examine the length and quality of the dwell times on attentional tasks, which may help distinguish between anxiety and depression effects in later aspects of attentional processing. To summarise, threat-biases do occur for depression but not as consistently as for anxiety. When they do occur, anxiety effects are rarely ruled out completely.

The studies in Chapters 8 and 9 do not include priming conditions and it is intended that the exposure duration will be quite short (500 msec) in line with many other studies using the dot probe and face in the crowd paradigm. Given that depression-congruent biases are often only found at longer stimulus durations and with priming conditions, measures of depression will not generally be included in the studies. They will only be included where depression levels may influence the results for other reasons, i.e., when using sad as well as angry and happy faces.

Summary of studies using facial stimuli

The main point to emerge from these studies investigating attentional biases for emotional faces is the general consensus of the findings. Whether using the dot probe, face in the crowd or cue-validity paradigm, the vast majority of studies revealed attentional biases for threat stimuli which are more pronounced for people with high anxiety levels. There is variation in the results, as some studies found attentional biases for emotional stimuli in general, some studies implicated trait anxiety, others state anxiety as the primary influence on attentional biases. One study suggested that trait anger not anxiety influences attention to angry faces (Van Honk, Tuiten, De Haan, Van den Hout, & Stam, 2001). Another study reported that social anxiety is involved in the classification of fear but not anger (Richards, French, Calder, Webb, Fox, & Young, in press). However, enhanced classification of faces as expressing anger was apparent for all individuals when placed in a stressful situation. It is likely that such variability can mainly be attributed to differences in methodology, such as the way in which participants were selected using anxiety scores, differences between self-report measures used and more fundamental differences in procedure, such as

stimulus exposure times and task instructions. Nevertheless, the findings using facial stimuli do generally tend to follow the same pattern and are more ecologically valid than findings using word stimuli. In many studies using word stimuli, anxiety related biases are often not found unless some sort of stressor is used.

There appear to be two main areas in the study of attentional biases where many questions remain unexplored: First, important in both anxiety and depression is the subsequent control of attention beyond the initial focus. Few studies have considered this issue, and future research should focus on this area using new techniques such as the cue-validity paradigm. Second, most of the research has concentrated on the relationship between attentional biases and emotional disorders such as anxiety and depression. As discussed earlier, EP represents a potential variable which may fill the gap in attentional bias research. Chapters 8 and 9 describe a series of four studies which investigate how EP may influence attention to emotionally meaningful stimuli.

Chapter 8

The role of emotional perception in the focus of attention to emotionally meaningful stimuli.

As discussed in Chapter 7, EI research has been criticised for relying purely on self-report data. Previous studies in this thesis have used questionnaire (studies 1, 2 and 3) and quasi-experimental methods (Study 4). As a result, the studies described in Chapters 8 and 9 use objective experimental methodologies in order to consider the behavioural effects of EP on attention.

Attentional bias research has concentrated largely on the relationship between attentional biases and anxiety (see Chapter 7). The studies described in Chapters 8 and 9 investigate the potential contribution of EP to attentional processing. EP involves surveying the emotional landscape, which is likely to influence responses to attentional tasks. The various ways in which EP may do this were discussed in Chapter 7. Consequently, there is a gap within the attentional bias research which needs exploring.

This Chapter describes two studies investigating how EP may direct and maintain attention to emotionally meaningful stimuli. The dot probe and face in the crowd methodologies, (described in Chapter 7), are employed. For both studies, results are treated as being significant if probability levels are < 0.05. Results where probability levels are < 0.10 will be treated as a trend. Where trends are of relevance to the hypotheses they will be discussed further, which is in contrast to non-significant effects which will not be discussed. Trends, however, will be treated with more caution than significant results.

Study 5

Study 5 considers whether attentional biases for emotional faces, which has been reported to be influenced by anxiety, is also mediated by EP.

Attentional bias for threat has been proposed to underly vulnerability to anxiety disorders (discussed in Chapter 7). Consequently, it was suggested that this accentuation of the normal threat bias may also be present for individuals with low EP, albeit for a different reason (see Chapter 7). This study considers whether individual levels of EP affect biases towards threat stimuli. Before reporting the

study, details concerning the selection of an anxiety measure, and the choice of methodology to be employed are discussed.

First, any study of attentional biases needs to include a measure of anxiety. A number of measures purportedly assess generalised anxiety. Perhaps the most widely used of these is the State-Trait Anxiety Inventory (STAI, Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAI measures both *State* anxiety and *Trait* anxiety each on a separate sub-scale. State anxiety is the intensity of an emotional state of anxiety at a given moment in time and is characterised by tension, apprehension, nervousness, worry and autonomic arousal. Trait anxiety is a relatively stable individual difference in anxiety level, like a stable personality characteristic. Both sub-scales consist of 20-items with a 4-point response scale. The State-anxiety scale consists of the responses "not at all, somewhat, moderately so, very much so," and asks for responses referring to feelings *"right now, at this moment"* on items such as "I feel calm, I am tense, I feel upset." 10 items are reversed scored on the State anxiety sub-scale. The Trait anxiety sub-scale also consists of a 4-point response scale with different options of "almost never, sometimes, often, almost always," and asks for an indication of how you *"generally feel."* Examples of items are "I feel like a failure, I feel rested, I am content." Nine items are reversed scored on the Trait anxiety sub-scale. The advantages of the STAI are the fact that it has been applied extensively in research, its psychometric properties are well established and norms are widely available.

Another scale used to measure anxiety is the Beck Anxiety Inventory (BAI, Beck, Epstein, Brown & Steer, 1988; cited in Wells, 1997). This 21-item self-report measure is designed to assess the severity of physiological and cognitive anxiety symptoms (e.g. numbness or tingling, feeling hot, wobbliness in legs) over the preceding week including the day of administration. Responses are recorded on a 4-point scale consisting of the options "not at all, mildly, moderately, severely," corresponding to individual scores of 0-3. The total score is the sum of the 21 ratings of individual items. The scale is fairly quick to administer and norms are available but has been criticised for only assessing worry rather than anxiety in general (Edelmann, 1992) and does not provide a measure of trait anxiety. Research has shown (see Chapter 7), that both state and trait anxiety have influenced attentional bias results, so it is important to assess both in Study 5.

The Hospital Anxiety and Depression scale (HADS, Zigmond, 1983) has also been used to assess anxiety. The HADS is a 14-item scale designed to provide a brief *state* measure of both anxiety (seven items) and depression (seven items). The anxiety responses are recorded on a 4-point scale where the options vary for each of the items. For eample, the item "I feel tense or wound up" has the options "most of

the time, a lot of the time, time to time occasionally, not at all" whereas the item "I get sudden feelings of panic" has the options "very often indeed, quite often, not very often, not at all." Each item is scored from 0-3 so total scores range from 0-21. Although the HADS is convenient as it is very short, again it only assess state anxiety. As discussed earlier, Study 5 needs to assess both state and trait anxiety in order to adopt an inclusive approach at this early stage in the series of studies.

Having considered three alternatives for measuring anxiety, the STAI was chosen for Study 5 and subsequent studies. The fact that it is robust, has been used widely in research and provides assessment of both state and trait anxiety were the main reasons for selecting the measure.

Second, in terms of the methodology, many studies have relied on word stimuli to investigate attentional biases, but this has been criticised on several grounds (see Chapter 7). As a result of these criticisms, the series of four studies use facial stimuli to investigate attentional biases, which have been shown to be more informative and ecologically valid (discussed in Chapter 7). Two main paradigms (dot probe and face in the crowd) have been appropriated to investigate attentional biases for emotional faces. Study 5 employs the dot probe methodology with photographs from the Ekman series in which to do this. As reported in Chapter 7, anxiety levels have consistently influenced results of experiments using the dot probe methodology, so it seems appropriate to see whether this is also the case for EP.

It is hypothesised that individuals with low EP, who may be less competent at processing emotional information, will show a bias for angry relative to neutral faces. On the other hand, individuals with high EP are more skilled surveying the emotional landscape and are likely to successfully identify whether threat is of real danger or not, so should demonstrate no such bias for angry faces. Consistent with previous research (discussed in Chapter 7), it is hypothesised that individuals with increasing levels of anxiety will show a bias for angry faces. Thus for different reasons, low EP and increasing levels of anxiety lead to an accentuation of the normal threat bias.

Methods

Participants

Fifty-five (22 male, 33 female) undergraduates volunteered to participate in the Study in exchange for course credit. The mean age was 27 years (range 18 - 50).

Materials

Self-report measures

EP was assessed using the 14-item APT (as in studies 2, 3 and 4). State and Trait Anxiety were assessed using the State-Trait Anxiety Inventory (STAI, Spielberger et al., 1983)[2]. The STAI was chosen as the measure of anxiety for reasons discussed above.

Attentional task

The facial stimuli for the dot probe task consisted of pairs of photographs of five different individuals taken from the Ekman series (Ekman & Friesen, 1975). For each person, one angry, one happy and one neutral photograph was selected all with recognition rates of at least 85%. Three of the individuals were male, two were female. An additional set of face pairs were prepared as practice items[3]. All combinations of face pairs were presented to both the left and right with two different probes, producing 40 angry-neutral face pairs, 40 happy-neutral face pairs and 40 angry-happy face pairs. The face pairs always consisted of two poses from the same person. The size of each facial image displayed on the computer screen was 45 x 70 mm and the distance between their inner edges was 70 mm. A full list of materials can be found in Appendix B.5-8.

Procedure

Prior to the attentional task, each participant completed the two self-report measures. They were then seated at a comfortable distance in front of the computer and were told they were about to take part in a reaction time experiment examining how people process and attend to visual information. Each trial consisted of a central fixation cross (+) for 500 msec, which was replaced by the display of a pair of faces, side by side, for 500 msec. Immediately following the display of the face pair, the probe stimulus was presented in the location of one of the faces. Participants were required to press one of two keys to indicate whether the type of probe was a colon (:) or two dots (..). The left index finger was used for one probe (:), while the right index finger was used for the other probe (..). The probe remained displayed until one of the response keys was pressed. There was then an inter-stimulus interval of

[2] Differences in detection of angry and happy faces between participants with high and low levels of state anxiety were tested. However, this factor did not interact with face detection times in Study 5 so is not mentioned further. A number of other researchers have also found no effect for state anxiety (e.g., Fox et al., 2000; Fox et al., 2002; Mogg et al., 2000; Van Honk et al., 2001).

[3] References to exact images were as follows: anger (EM5-14, JB1-23, MF2-7, MO2-11, WF3-1 & A1-14), happiness (EM4-7, JB1-9, MF1-6, MO1-4, WF2-12 & A1-6), and neutral (EM2-4, JB1-3, MF1-2, MO1-5, WF2-5 & A1-2).

500 msec before the fixation cross for the next trial was presented. There were 24 practice trials to help participants familiarise themselves with the procedure, followed by 120 experimental trials. These were broken up into four blocks of 30 trials with the opportunity for participants to take a short break if they wished. Each trial appeared once in every block. There were an equal number of each type of probe, i.e., dots (left or right on the screen) and colons (left or right on the screen) in each block. Participants were encouraged to respond as quickly and accurately as possible. Presentation order was randomised for each participant.

Results

Self-report measures

Median splits were performed on both EP scores and STAI trait anxiety scores. For EP, those scoring more than the median of 70 (n = 28) were allocated to the high EP group, and those scoring 70 or less (n = 25) to the low EP group. Similarly, participants were divided into two groups according to whether or not their trait anxiety scores were less or equal to the median of 40 (n = 27) or greater than 40 (n = 26). One participant with an extreme trait anxiety score of 79 was removed from the data set. The correlation between EP and trait anxiety scores was not significant (r = -0.01, n.s.).

Data screening

For all participants, mean RTs were computed for each condition following a series of steps. Responses less than 250 msec or greater than 1500 msec were removed as they were either too quick or too slow in relation to the spread of the data reflecting anticipatory or delayed/missed responses. Missing data were then replaced with the overall mean. Finally, the mean for each subject within each experimental condition was calculated using harmonic means, which is the most suitable measure of central tendency following the screening methods used (Ratcliff, 1993). Participants were removed if missing data and errors accounted for more than 15% of the total. This criterion did not result in the removal of any participants. Following data screening, a second participant was excluded from further analysis as their average reaction time (RT) was more than 2 standard deviations above the mean. This left a total of 53 participants. The overall mean RT was 613 (SD = 121). Table 8.1 summarises the RT data.

Table 8.1 Mean reaction time and standard deviations (in parentheses) to probes (in msec).

Face Type	Face Location	Probe Location	Low trait Anxiety N=27 *Mean (SD)*	High trait Anxiety N=26 *Mean (SD)*	Low EP N=25 *Mean (SD)*	High EP N=28 *Mean (SD)*	Low EP/Low trait Anxiety N=12 *Mean (SD)*	Low EP/High trait Anxiety N=13 *Mean (SD)*	High EP/Low Trait Anxiety N=15 *Mean (SD)*	High EP/High trait Anxiety N=13 *Mean (SD)*
ANGER	Left	Left	576 (111)	644 (117)	623 (122)	600 (116)	595 (91)	679 (120)	585 (126)	650 (104)
(relative to	Left	Right	573 (99)	645 (116)	621 (134)	600 (95)	578 (107)	694 (131)	589 (102)	640 (95)
neutral)	Right	Left	585 (113)	643 (118)	627 (120)	604 (117)	603 (90)	675 (130)	601 (134)	642 (111)
	Right	Right	588 (108)	644 (110)	620 (117)	613 (110)	614 (104)	650 (120)	603 (120)	655 (95)
HAPPY	Left	Left	577 (114)	650 (117)	619 (121)	609 (122)	600 (91)	662 (125)	590 (132)	666 (107)
(relative to	Left	Right	588 (101)	639 (107)	620 (113)	609 (103)	603 (90)	660 (123)	608 (113)	652 (98)
neutral)	Right	Left	585 (115)	634 (119)	627 (127)	597 (112)	625 (100)	663 (136)	595 (131)	632 (97)
	Right	Right	572 (105)	651 (118)	627 (133)	600 (105)	590 (96)	680 (134)	585 (114)	651 (108)

Power

The cell sizes in studies 5, 6 and 7 were all above 10 resulting in an acceptable level of power (Cohen, 1992), and are comparible with those found in the literature.

Calculating attentional bias scores

To simplify the analyses, attentional bias scores were calculated for each emotional face type by subtracting the mean RT when the emotional face and probe were in the same position, from the mean RT when the emotional face and probe were in different positions (MacLeod & Mathews, 1988; Mogg, Mathews, & Eysenck, 1992).

Angry Bias Score = ½ [(ArPl - AlPl) + (AlPr - ArPr)]

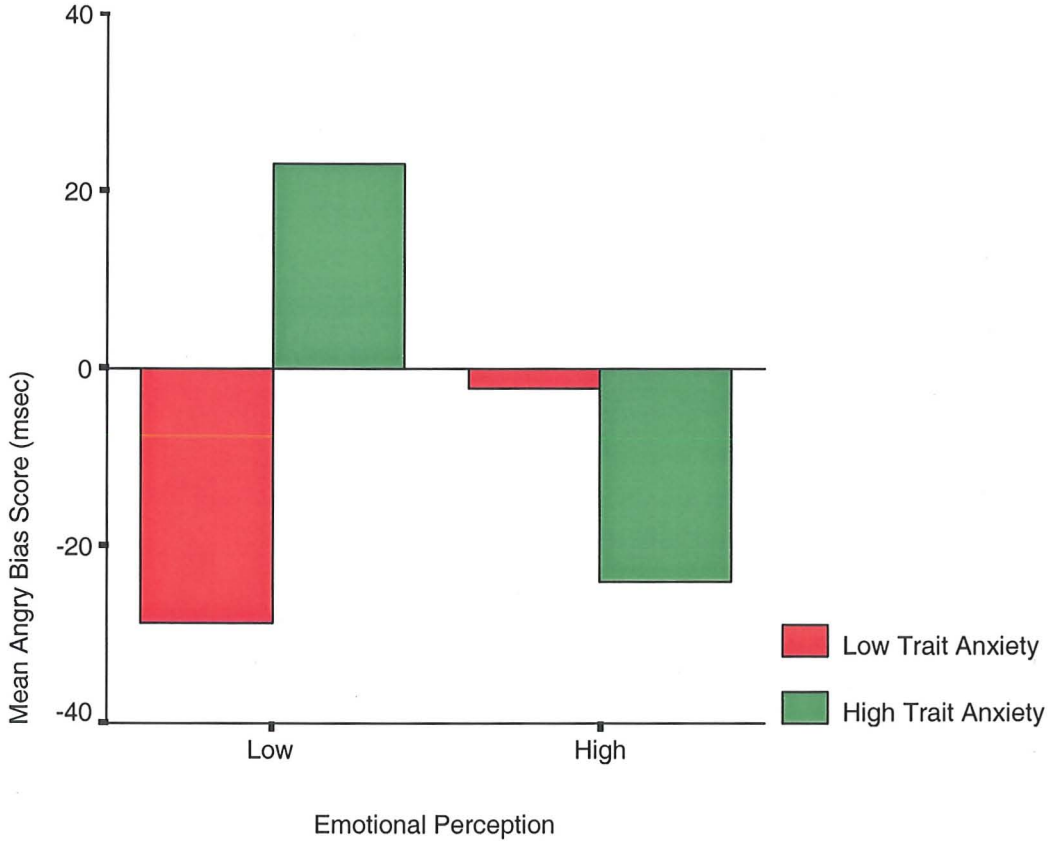
where A = angry face, P = probe, r = right position, and l = left position. ArPl refers to RT when the angry stimulus was on the right and probe was on the left, and likewise for the other abbreviations. A separate bias score was calculated similarly for trials with happy-neutral face pairs. A positive value indicates a shift of attention towards the emotional face relative to the neutral face (vigilance), and a negative value indicates a shift away from the emotional face toward the neutral face (avoidance).

To test the main hypotheses, two separate 2 x 2 independent groups ANOVAs were carried out using EP scores (high vs. low) and trait anxiety scores (high vs. low) as the independent variables, and either angry or happy bias scores as the dependent variable.

Analysis of the angry bias

In the analysis of angry bias, there was no significant main effect of EP [$F(3,49) = 0.34$, $MSe = 3466.39$, n.s] and no significant main effect of trait anxiety [$F(3,49) = 0.75$, $MSe = 3466.39$, n.s.]. However, there was a significant interaction between EP and trait anxiety [$F(3,49) = 4.69$, $MSe = 3466.39$, $p < 0.05$], where a combination of low EP and high trait anxiety scores resulted in a positive bias for angry faces (Fig 8.1). Full ANOVA tables for the analysis of angry bias can be found in Appendix A.5.

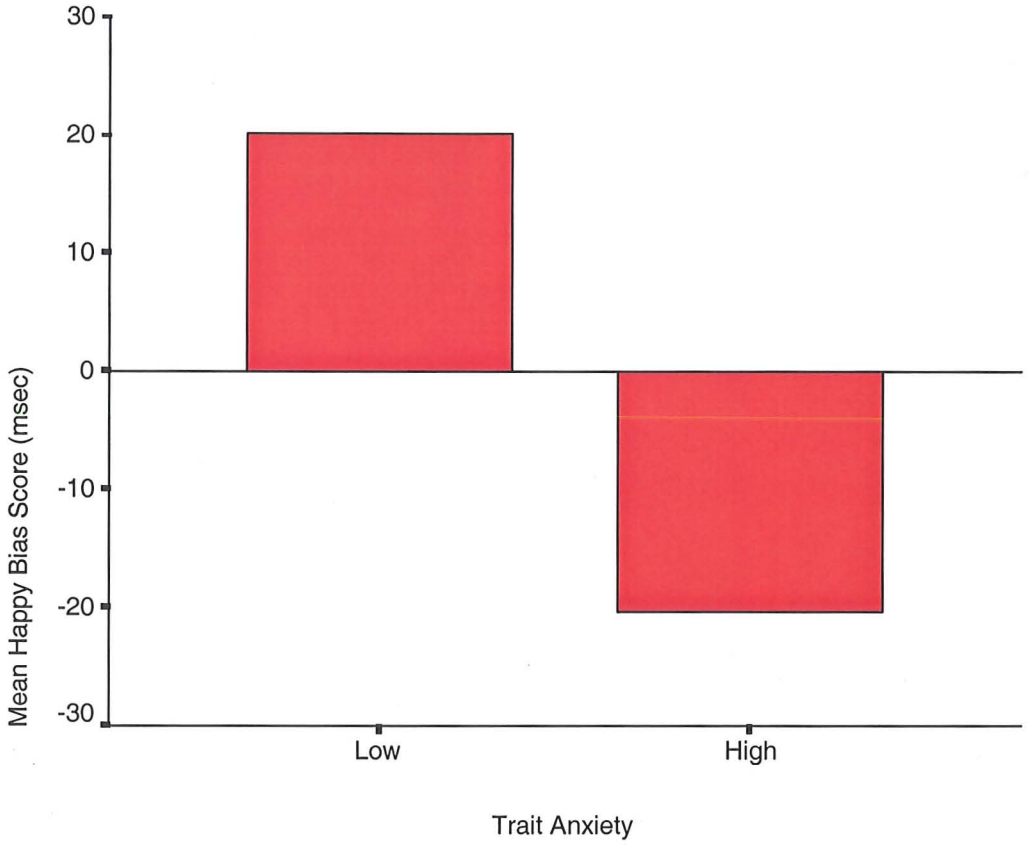
Fig 8.1 Interaction between emotional perception and trait anxiety on angry bias scores. Positive values indicate bias towards anger relative to neutral.



Analysis of happy bias

In the analysis of happy bias there was no significant main effect of EP [$F(3,49) = 0.01$, $MSe = 4559.04$, n.s.], but there was a significant main effect of trait anxiety [$F(3,49) = 4.82$, $MSe = 4559.04$, $p < 0.05$], with low anxious individuals showing a bias towards happy faces and high anxious individuals avoiding happy faces (Fig 8.2). There was no interaction between EP and trait anxiety [$F(3,49) = 0.34$, $MSe = 4559.04$, n.s.]. Full ANOVA tables for the analysis of happy bias can be found in Appendix A.5.

Fig 8.2 Happy bias scores (in msec) for trait anxiety groups. Positive values indicate bias towards happy faces relative to neutral.



Discussion

The aim of Study 5 was to investigate how EP may influence attention to emotionally meaningful stimuli. Anxiety was included as it has been consistently shown to influence attentional biases. The results showed a threat bias for participants with low scores on EP, but only those who also had increased levels of anxiety. There was also a bias towards happy stimuli for participants with low anxiety scores, and away from happy stimuli for participants with higher scores on anxiety.

The results of Study 5 suggest that a combination of EP and anxiety are important in explaining attentional biases for threat. It may be that EP and anxiety operate in the same way but are independent, due to the lack of correlation between the two. Individuals with low EP are less skilled at identifying whether threat is of real danger or not, so are likely to focus on an angry face in case it is important. Increased levels of anxiety may sensitise the individual to threat, providing a threat-vigilant style with an increased perception of danger in the environment. Thus for

different reasons, low EP and increased levels of anxiety lead to an accentuation of the normal threat bias.

The pattern of results from Study 5 can be explained thus. Participants low on EP and with higher levels of anxiety focus on an angry face in case it is important, and rapidly direct attention towards threat due to a threat-vigilant style. Those with high EP and increasing levels of anxiety focus rapidly on threat but are able to redirect attention elsewhere, thereby showing a bias away from angry faces. A similar pattern is observed for those low in EP and with lower levels of anxiety, although this is likely due to a lack of attentional focus to start with. Perhaps a certain threshold level of anxiety is required to direct attention towards threat in the first place. Finally, participants with high EP and low levels of anxiety show no bias reflecting chance fluctuations in the focus of attention.

In the analysis of happy bias, individuals with increasing levels of anxiety showed a bias away from happy faces, whereas individuals with low scores on anxiety showed a bias towards happy faces. This suggests that the anxiety-related attentional bias was specific to threat information, rather than emotional material in general. However, given a simple binary choice of one of two faces, it may be relatively easy to identify an unambiguous happy face as being non-threatening, hence individuals with increasing levels of anxiety show a bias away from them. It is possible that with a more difficult task using different stimuli that anxious individuals would not be able to divert their attention away so quickly.

There are several limitations of using the dot probe methodology which may have influenced the results. First, there were only two stimuli in the environment, so the dot probe methodology cannot specifically determine whether attention is directed toward one class of stimulus or away from another. The relatively simple task consisting of a binary choice may lead to the easy identification of unambiguous non-threatening stimuli. For example, when faced with a more complex task, highly anxious individuals may not find it so easy to divert their attention away (or not have their attention grabbed) by happy faces. Second, there are problems of controlling for inadvertent shadows and other visual features when using real faces (as discussed in Chapter 7).

In consideration of these methodological criticisms, Study 6 employs a different experimental paradigm: the face in the crowd technique, pioneered by Hansen & Hansen (1988) in order to further investigate the role EP in potentially threatening decisions.

Study 6

The results from Study 5 suggest that a combination of EP and anxiety are responsible for attentional biases for threat. However, the previous discussion described a number of methodological criticisms of the dot probe task. In an attempt to overcome these limitations, Study 6 employs the face in the crowd technique to further examine the contribution of EP to attentional processing. This technique has been argued to be a purer measure than the dot probe task (e.g., Byrne & Eysenck, 1995), particularly because it is a more realistic task consisting of a number of stimuli. Furthermore, photographs of real faces were used in Study 5, for which it is impossible to control for inadvertent shadows and other visual features. These problems were overcome in Study 6 by using the schematic faces developed by Fox et al. (2000).

The face in the crowd task presents participants with a 'crowd' display, normally consisting of a number of faces arranged in a grid of varying size, and the task is to indicate whether all the faces are the same or whether one is different from the rest.

Based on the results of Study 5, it is hypothesised that individuals with low EP will show a bias for angry faces. As discussed earlier, individuals with low EP appear to be less skilled at processing affective stimuli, thus may focus on angry faces in case they are important. This will be reflected in rapid detection of a single angry face in a neutral crowd, or having attention held for longer by a display of all angry faces. Based on previous research and the results of Study 5, it is predicted that individuals with increasing levels of anxiety will show a bias for angry faces due to a general vigilance for threat stimuli. This will be shown by quicker detection of a different angry face in a neutral crowd, or dwelling for longer on all angry crowds.

Methods

Participants

Fifty (18 male, 32 female) undergraduates volunteered to participate in the study in exchange for course credit. The mean age was 24 years (range 21 - 48).

Materials

Self-report measures

EP was assessed using the 14-item APT. Trait Anxiety was assessed using the STAI (Spielberger et al., 1983).

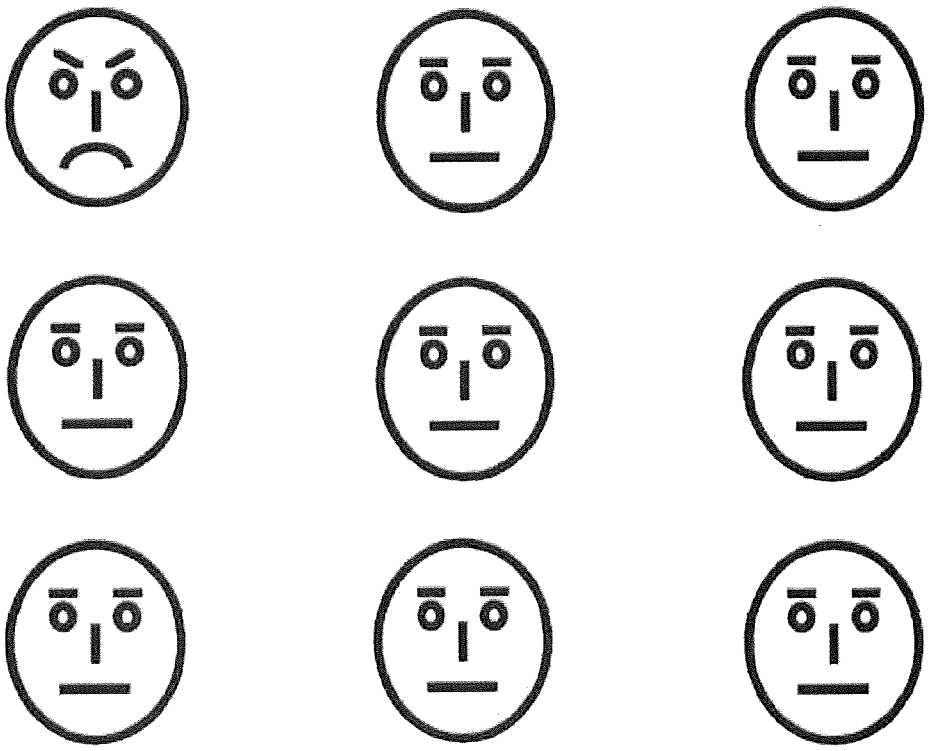
Attentional task

The stimuli, taken from Fox et al. (2000), were composed of nine schematic faces arranged in a 3 x 3 grid (Fig 8.3). There were nine types of display in total. The three *same* displays consisted of nine faces all displaying the same expression (all angry, all happy, all neutral). These were presented 18 times each giving a total of 54 *same* displays. The six *different* displays consisted of eight distractor faces expressing the same emotion and one target face expressing a different emotion. All distractor expressions were combined with all target expressions, making six different target-distractor combinations. The target could occur at any of the nine positions in the grid. Thus there were 54 *different* displays (3 crowds x 2 distractors x 9 locations). The faces were drawn in black against a white background. The size of each face displayed on the computer screen was 35 x 40 mm; the distance between their inner edges was 35 mm horizontally and 15 mm vertically. A full list of materials can be found in Appendix B.5-8.

Fig 8.3 Examples of stimulus displays used in Study 6. (a) All angry faces (same display), (b) 1 angry face in a background of neutral faces (different display).

(a)

(b)



Procedure

Prior to the attentional task, each participant completed the two self-report measures. They were then seated at a comfortable distance in front of a computer and were told they were about to take part in a reaction time experiment examining how people process and attend to visual information. Each trial consisted of a central fixation cross (+) for 500 msec, which was replaced by the display of faces in a grid. Participants were then required to press one of two keys to indicate whether the display of faces were all the same or if one face was different. The left index finger was used for the "*same*" displays, while the right index finger was used for the "*different*" displays. The faces remained displayed until one of the response keys was pressed. There was then an inter-stimulus interval of 500 msec before the fixation cross for the next trial was presented. There were 20 practice trials to help participants familiarise themselves with the procedure followed by 108 experimental trials. These were broken up into three blocks of 36 trials with the opportunity for participants to take a short break if they wished. There were 18 *same* displays and 18 *different* displays (three taken from each of the six combinations) in each block. Participants were encouraged to respond as quickly and accurately as possible. Presentation order was randomised within blocks.

Results

Self-report measures

Median splits were performed on both EP scores and STAI trait anxiety scores. For EP, those scoring more than the median of 70 (n = 25) were allocated to the high EP group, and those scoring 70 or less (n = 25) to the low EP group. Similarly, participants were divided into two groups according to whether or not their trait anxiety scores were less or equal to the median of 39 (n = 25) or greater than 39 (n = 25). The correlation between EP and trait anxiety scores was not significant (r = -0.24, n.s.).

Data screening

The data screening process was the same as for Study 5. The only difference for Experiment 2 was that responses less than 400 msec or greater than 3000 msec were removed as they were either too quick or too slow in relation to the spread of the data. No participants were removed from the data set following the screening process.

The overall mean RT was 1512 (SD = 550). Due to the unbalanced design, separate analyses were computed for 'same' trials and for 'different' trials. For both analyses there were two independent groups factors; EP (high vs. low) and trait anxiety (high vs. low).

Analyses of the *same* displays

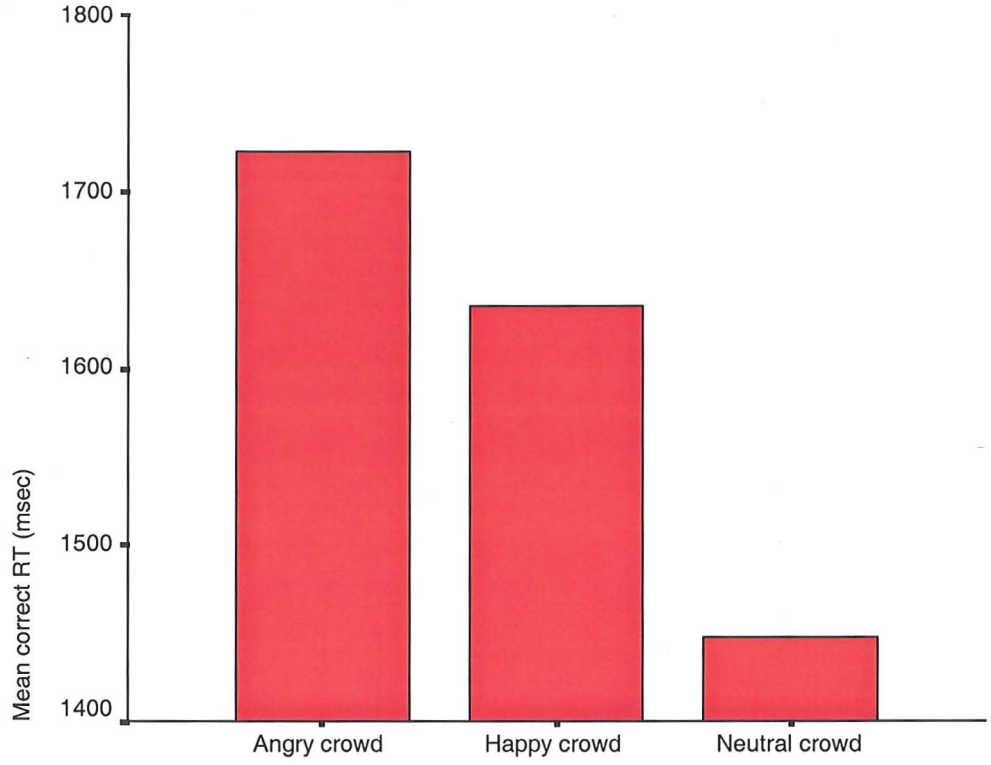
A 2x2x3 mixed ANOVA was conducted on the RT data with the two independent groups factors outlined above (EP and anxiety) and one within groups factor, type of crowd (all angry, all happy, all neutral). Table 8.2 summarises the RT data.

Table 8.2 Mean reaction time and standard deviations (in parentheses) to the 'same' displays (in msec).

	Angry crowds *Mean (SD)*	*Happy crowds* *Mean (SD)*	*Neutral crowds* *Mean (SD)*
Low trait Anxiety N=25	1638 (380)	1592 (384)	1384 (395)
High trait Anxiety N=25	1807 (349)	1677 (350)	1510 (325)
Low EP N=25	1768 (376)	1637 (367)	1435 (355)
High EP N=25	1677 (368)	1532 (373)	1459 (379)
Low EP/Low trait Anxiety N=11	1681 (400)	1613 (415)	1484 (375)
Low EP/High trait Anxiety N=14	1838 (355)	1657 (340)	1536 (334)
High EP/Low trait Anxiety N=14	1605 (376)	1577 (373)	1410 (430)
High EP/High trait Anxiety N=11	1769 (354)	1702 (379)	1440 (382)

There was a main effect for type of crowd [$F(1,46) = 48.13$, $MSe = 66869.63$, $p < 0.05$] with Newman-Keuls post hoc comparisons indicating that angry crowds were responded to more slowly than happy crowds, which were responded to more slowly than neutral crowds (Fig 8.4). There were no main effects for either EP [$F(1,46) = 0.27$, $MSe = 358700.18$, n.s.] or anxiety [$F(1,46) = 0.94$, $MSe = 358700.18$, n.s.]. There was no interaction between EP and type of crowd [$F(1,46) = 0.86$, $MSe = 66869.63$, n.s], or trait anxiety and type of crowd [$F(1,46) = 1.35$, $MSe = 66869.63$, n.s.]. The three-way interaction between type of crowd, EP and anxiety did not reach significance [$F(1, 46) = 0.26$, $MSe = 66869.63$, n.s.]. Full ANOVA tables for analyses of the same displays can be found in Appendix A.6.

Fig 8.4 Mean reaction times for the same crowd displays.



Analyses of the *different* displays

A 2x2x2 mixed ANOVA was conducted on the RT data with the two independent groups factors outlined above (EP and anxiety) and one within groups factor, type of target (angry in neutral crowd, happy in neutral crowd). Table 8.3 summarises the RT data. Analyses for a neutral face in angry and happy crowds were conducted but results were non-significant and are not discussed further.

Table 8.3 Mean reaction time and standard deviations (in parentheses) to the 'different' displays (msec).

	Angry face (neutral crowd) *Mean (SD)*	*Happy face (neutral crowd)* *Mean (SD)*
Low trait Anxiety N=25	1212 (270)	1245 (275)
High trait Anxiety N=25	1062 (200)	1325 (242)
Low EP N=25	1064 (226)	1295 (256)
High EP N=25	1211 (249)	1275 (268)
Low EP/Low trait Anxiety N=11	1148 (265)	1273 (287)
Low EP/High trait Anxiety N=14	998 (200)	1313 (240)
High EP/Low trait Anxiety N=14	1264 (274)	1224 (276)
High EP/High trait Anxiety N=11	1145 (210)	1342 (257)

There was a main effect for type of target [$F(1,46) = 45.30$, $MSe = 12096.82$, $p < 0.05$] with angry faces being detected more quickly than happy faces, and no main effects for either EP [$F(1,46) = 0.81$, $MSe = 112385.38$, n.s.] or anxiety [$F(1,46) = 0.17$, $MSe = 112385.38$, n.s.]. There was an interaction between EP and type of target [$F(1,46) = 10.19$, $MSe = 12096.82$, $p < 0.05$], and an interaction between trait anxiety and type of target [$F(1,46) = 23.11$, $MSe = 12096.82$, $p < 0.05$]. The three-way interaction between type of target, EP and anxiety did not reach significance [$F(1,46) = 0.30$, $MSe = 12096.82$, n.s.]. Full ANOVA tables for analysis of different displays can be found in Appendix A.6.

Simple main effects for EP

The interaction between type of target and EP is presented in Fig 8.5(a). Individuals with low EP were faster at locating an angry face in a neutral crowd than individuals with high EP [$F(1,48) = 4.74$, $Mse = 12096.82$, $p < 0.05$], but there was no significant difference between individuals with low and high EP finding a happy face in a neutral crowd [$F(1,48) = 0.69$, $Mse = 12096.82$, n.s.]. There was no significant difference between individuals with high EP locating an angry face in a neutral crowd than a happy face in a neutral crowd [$F(1,24) = 2.30$, $Mse = 12096.82$, n.s.], but individuals with low EP were quicker at locating a discrepant angry than happy face in a neutral crowd [$F(1,24) = 55.23$, $Mse = 12096.82$, $p < 0.05$].

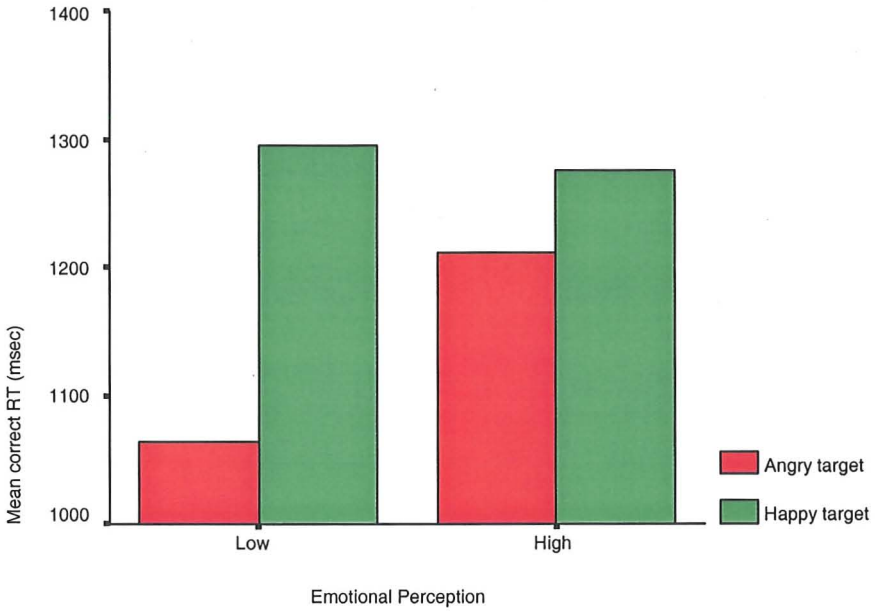
Simple main effects for anxiety

The interaction between type of target and trait anxiety is shown in Fig 8.5(b). High trait anxious individuals were faster at locating an angry face in a neutral crowd than low anxious individuals [$F(1,48) = 4.99$, $Mse = 12096.82$, $p < 0.05$], but there was no significant difference between low and high anxious individuals finding a happy face in a neutral crowd [$F(1,48) = 1.14$, $Mse = 12096.82$, n.s.]. High trait

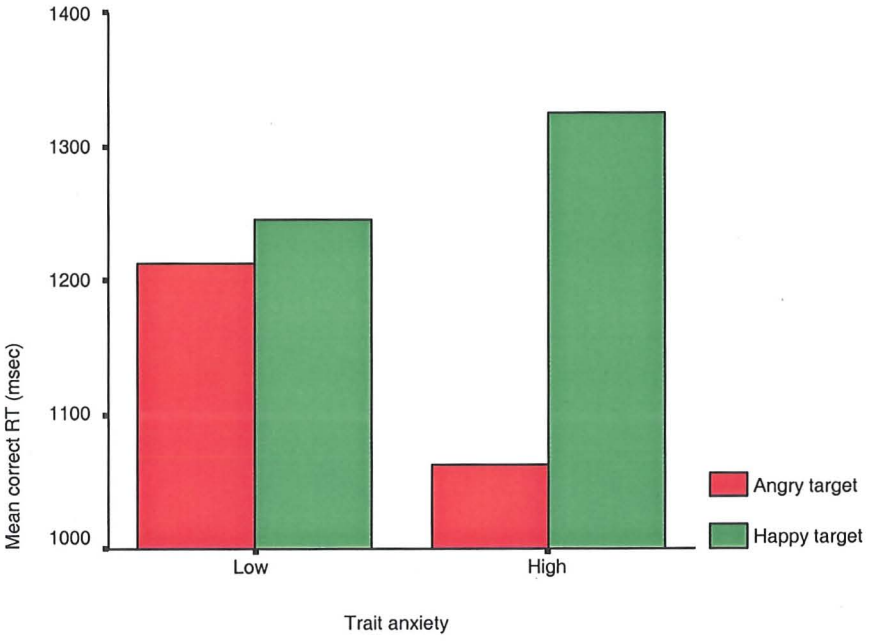
anxious individuals were faster at locating an angry face in a neutral crowd than a happy face in a neutral crowd [$F(1,24) = 89.21$, $Mse = 12096.82$, $p < 0.05$], but for low trait anxious individuals, the difference between locating an angry and happy face in a neutral crowd did not reach significance [$F(1,24) = 0.67$, $Mse = 12096.82$, n.s.].

Fig 8.5 Mean reaction times for the different displays involving interactions between (a) emotional perception and type of target and (b) trait anxiety and type of target. Both angry and happy targets are relative to a neutral crowd.

(a)



(b)



Discussion

The aim of Study 6 was to replicate the threat bias found in Study 5, and to further examine the contribution of EP to the processing of emotionally meaningful stimuli using a purer task with more realistic stimuli.

There was a threat bias for individuals with low EP or individuals with increased levels of anxiety. When displays were all the same, people were slower (i.e. more distracted) when detecting angry rather than happy or neutral crowds. This indicated that a display of all angry faces held attention the longest for all individuals. When displays contained a different face, participants were faster to detect the different face when it was angry rather than happy in a background of neutral faces. Once again this demonstrates the superiority of threat stimuli which appear to grab attention for all individuals. This threat detection effect was greater for individuals with low EP and higher levels of anxiety.

Individuals with low EP were faster at locating a discrepant angry face in a neutral crowd than individuals with high EP; and low EP individuals were faster at locating an angry face in a neutral crowd than a happy face in a neutral crowd. As predicted, there was a tendency for individuals with low EP to show a bias towards threat stimuli, when locating a different angry face in a neutral crowd. This is in line with the results of Study 5 and the threat bias hypothesis.

Individuals with increasing levels of trait anxiety were significantly faster at locating an angry face in a neutral crowd than individuals with low trait anxiety; and individuals with increased levels of anxiety were also faster at locating an angry face in a neutral crowd than a happy face in a neutral crowd. As predicted, there was a tendency for individuals with increasing levels of anxiety to show a bias towards threat stimuli, when locating a different angry face in a neutral crowd. This is in line with much of the previous research employing the face in the crowd paradigm (e.g., Byrne & Eysenck, 1995; Mogg & Bradley, 1999b), and lends support to the threat bias hypothesis. As the expected anxiety effect was demonstrated in Study 6, its absence in Study 5 is less concerning. This supports the suggestion that anxiety effects may not be produced when stimuli have a low threat-value (see general discussion below).

Once again, a combination of low EP and increased levels of anxiety seem to be important in attentional bias for threat. As in Study 5, they operate independently and for different reasons both lead to an accentuation of the normal threat bias. However, this pattern may not be exclusive to threat stimuli, as there is some tentative evidence from the data to suggest that happy stimuli may be processed in a similar way. The means show that individuals with low EP were more distracted by angry and happy crowds than individuals with high EP. Similarly, individuals with increasing levels of

anxiety were more distracted by both angry and happy crowds than individuals with lower levels of anxiety. These results would seem to suggest a general sensitivity to emotional material for both individuals with low EP and higher levels of anxiety. This may be the case for low EP individuals who have an overall difficulty processing emotional stimuli, which is most likely due to a lack of interest in the material in the first place. This bias for emotional information in low EP individuals is reflected in different ways according to whether displays contain a discrepant emotional face or are all the same (see general discussion below). In contrast, anxiety effects may still be explained by the threat hypothesis. Happy faces may also appear to be potentially threatening, particularly for highly anxious individuals who may fear social ridicule and being laughed at. There is no doubt that threat bias is more pronounced than any indication of a happy bias for all individuals. This highlights the importance of threat stimuli, but does not rule out the fact that happy stimuli may follow the same pattern, just to a lesser extent.

The main limitation of Study 6 was the focus on comparing angry and happy stimuli rather than considering the possible similarities in processing between the two. More important than whether an angry face is detected quicker, or holds attention for longer than a happy face per se, is whether angry and happy faces are processed in similar ways. This comparison will enable us to assess the relative contribution of the threat and emotionality hypotheses.

General discussion

The two studies described in Chapter 8 investigate how EP may direct and maintain attention to emotionally meaningful stimuli. In Study 5, attentional biases towards angry faces were only found for participants who were low in EP and also had increasing levels of anxiety. In Study 6, detection of threat was again facilitated by a combination of low EP and increasing levels of anxiety. There was, however, some tentative evidence to suggest that happy faces may be processed in a similar way.

In Study 5 using the dot probe task, the effects of EP appear to be explained by the threat hypothesis, where individuals with low EP showed a bias towards angry faces, but only when individuals also had higher levels of anxiety. For different reasons, low EP and increasing levels of anxiety lead to an accentuation of the normal threat bias.

Individuals with low EP tend to be less skilled in surveying the emotional landscape. Consequently, as predicted, they may be less successful at processing a stimulus for its affective impact, thus they may focus on an angry face in case it is

important. This is not because they have a threat-vigilant style with increased perception of danger, like individuals with increasing levels of anxiety, but more likely as they are just less skilled at identifying whether threat is of real danger or not, so in this case respond to it quickly. On the other hand, individuals with high EP are more skilled surveying the emotional landscape. They may also be more interested in affective material, thinking more carefully about them, thus taking longer to respond to emotional faces. They are likely to successfully identify whether threat is of real danger or harmless demonstrating no bias for angry faces.

The effects of anxiety also appear to be explained by the threat hypothesis in Study 5. Individuals with higher levels of anxiety showed an attentional bias for angry faces, only when they also had low EP. Increasing levels of anxiety result in a tendency to adopt a threat-vigilant style leading to an increased perception of danger in the environment. As predicted, in vulnerable individuals, a stressful event is more likely to elicit a "vigilant" processing style, where attention is grabbed by relatively mild threatening cues, such as the angry faces in Study 5. There was no main effect of anxiety, which is in contrast to many previous studies (e.g., Bradley et al., 1998; Mogg & Bradley, 1998; Mogg & Bradley, 1999b). This could be because the threat value of the stimuli may not have been sufficient to elicit attentional bias. Indeed, previous studies have found no attentional bias for threat in highly anxious individuals when the stimuli have been proposed to be low in threat value (Mogg & Bradley, 2003). The lower threat value of the stimuli in Study 5 may be due to the various methodological problems encountered when using real faces, as discussed earlier. It is still a surprising result nonetheless.

In Study 6 employing the face in the crowd technique, individuals with low EP showed a bias towards angry faces, particularly when locating a different angry face in a neutral crowd. This is in line with the prediction that a different angry face will grab attention, and low EP individuals will respond quickly in case it is important. In Study 5, it was suggested that this may occur because low EP individuals are less skilled at identifying whether threat is of real danger or harmless, not because they adopt a threat-vigilant style like individuals with increasing levels of anxiety. However, it seems somewhat counter-intuitive that individuals with low EP should do *better* at the face in the crowd task. Presumably, individuals with high EP, who may be more skilled at surveying the emotional landscape, would be expected to do better. A possible explanation is that individuals with low EP do better at the task as they are less affected by the emotional content of the stimuli. As a result, they can treat the task as a traditional visual search exercise and respond more quickly to a different face in a neutral crowd. The lack of pop-out gradients (e.g., Fox et al., 2000; Öhman et al., 2001) supports the notion that emotionally relevant information is not processed pre-

attentively, so working out the emotions may take time. Individuals with high EP are more affected by emotional stimuli, so take longer to do the visual search task. If they were to do the task quickly, the emotional information may interfere with their visual search.

It was also predicted that low EP individuals would have their attention held for longer by a display of all angry faces. Although there was a main effect demonstrating that displays of identical angry faces held attention for longer for all individuals, inspection of the means suggests only partial support for this hypothesis. Not only were low EP individuals more distracted by angry crowds, they were also more distracted by happy crowds than high EP individuals. This suggests a general sensitivity to emotional stimuli rather than just threat stimuli. Contrary to the explanation for Study 5, individuals with low EP may not focus on an angry face *because* it is threatening, nor interpret a happy face as being an ambiguous threat, they may just have difficulty processing emotional material. As mentioned earlier, this is reflected in quicker responding to a different angry face in a neutral crowd, due to a lack of interest in the emotional content of the stimuli. In contrast, when presented with whole scenes of emotional content (whether angry or happy displays), low EP individuals have their attention held for longer. This may be because they are less familiar surveying complex emotional scenes as they usually pay them little interest. Consequently, the scene is distracting, which results in difficulty processing the material and longer response times.

The suggestion that positive emotional material is processed in a similar way to negative material is tentative at this stage as it is only based on the pattern of means. It is important to investigate further in order to cast light on the emotionality verses threat hypothesis (discussed in Chapter 7).

In Study 6, consistent with the threat hypothesis, individuals with increasing levels of anxiety exhibited greater attentional bias for a discrepant angry face than a discrepant happy face in a background of neutral faces. As in Study 5, increasing levels of anxiety result in a tendency to adopt a threat-vigilant style leading to an increased perception of danger in the environment. Thus attention is grabbed by relatively mild threatening cues, such as the schematic angry face in Study 6. Similar to previous findings (Fox et al., 2001; Mogg et al., 2000), low anxious individuals also showed a bias toward detection of angry faces, but this bias was significantly less pronounced.

It was also predicted that individuals with higher levels of anxiety would be slowed down by angry crowds more than they would by neutral or happy ones, as compared to low anxious individuals. Although there was a main effect demonstrating that displays of identical angry faces held attention for longer for all

individuals, inspection of the means suggests only partial support for this hypothesis. Individuals with higher levels of anxiety did dwell longer on all angry crowds than low anxious individuals, but they also responded slower (i.e., were more distracted) by happy crowds to a greater extent than low anxious individuals. Again tentative, as with EP is based on pattern of means, but suggests a general sensitivity to emotional stimuli, rather than purely threat stimuli. However, just because positive stimuli may capture attention in a similar way to negative stimuli, the results may still be explained in terms of a threat hypothesis. It is possible that for highly anxious individuals, who may fear social ridicule and being laughed at, that a happy face or smile may also appear to be potentially threatening. Indeed, using the face in the crowd technique, Gilboa-Schechtman et al. (1999) found that individuals with generalised social phobia were distracted by both angry and happy crowds, suggesting general sensitivity to emotional expression. This general sensitivity was not apparent in Study 5 employing the dot probe paradigm, where individuals with increased levels of anxiety showed a bias away from happy faces. However, the nature of the task consisted of a relatively simple binary choice where one happy face may have appeared to be unambiguously non-threatening. In contrast, the display of *nine* happy faces in Study 6 may have been more frightening to individuals with higher levels of anxiety. Additionally, the schematic happy faces used in Study 6 are argued to be more realistic than the photographs used in Study 5, thus were probably more threatening.

In Study 5, although individuals with low anxiety did not show a significant bias away from threat stimuli, they did show a bias towards happy stimuli. Overall, therefore, the results appear to lend support to the interaction theory of anxiety (Williams et al., 1988; 1997) outlined in Chapter 7, which predicts that high trait anxious individuals should become more vigilant, and low trait anxious individuals more avoidant of threat. However, Mogg & Bradley (1998) proposed an alternative cognitive-motivational theory to account for attentional biases in anxiety (also outlined in Chapter 7). In contrast to the interaction hypothesis, all individuals, including those with low trait anxiety, should be more vigilant for high rather than mild threat stimuli. When stimuli are appraised as being mildly aversive and having a low subjective threat value (as in Study 5), there may be a tendency to direct attention away from them. It could be, therefore, that with more ecologically valid stimuli or using stimuli with a higher subjective threat value, low anxious individuals would also show a bias towards threat. To summarise, the data from Study 5 seem to lend more support to the interaction hypothesis than the cognitive-motivational account, but were not conclusive at this stage.

In Study 6, the results for anxiety provide support for the cognitive-motivational theory, where all individuals are proposed to be more vigilant for threat stimuli. In

contrast to Study 5, as subjective threat value increases (with the increasing number of stimuli used in Study 6 for example), individuals with both low and increasing levels of anxiety were indeed more vigilant for threat stimuli, with the effect being more pronounced for individuals with higher levels of anxiety.

To summarise, the two studies described in Chapter 8 have identified EP as an important mediator in attentional biases to emotional material. Generally, the results lend support to the threat hypothesis, where people preferentially attend to threatening stimuli in the environment. In both studies, a combination of low EP and increased levels of trait anxiety result in a bias for angry faces. However, there were some tentative results from Study 6 indicating that low EP individuals and participants with increased levels of anxiety may show a similar bias towards happy stimuli. This would appear to lend support to the emotionality hypothesis, which suggests that positive emotional stimuli may capture attention to the same extent as negative emotional stimuli. Given the tentative evidence from Study 6 and previous results demonstrating a general sensitivity to emotional material (e.g., Fox et al., 2002; Gilboa-Schechtman et al., 1999; Martin et al., 1991), the studies described in Chapter 9 focus on the possible similarities in processing between emotionally meaningful stimuli. Additionally, they aim to assess the relative contribution of the threat and emotionality hypotheses to attentional processing.

Chapter 9

The effect of emotional perception in attentional processing: General sensitivity to emotional material

The results from the two studies described in Chapter 8 generally lend support to the threat hypothesis, where people preferentially attend to threatening stimuli in the environment. In both studies 5 and 6, a combination of low EP and increased levels of trait anxiety resulted in a bias for angry faces. However, there were some tentative results from study 6 indicating that low EP individuals and participants with increased levels of anxiety may show a similar bias towards happy stimuli, which would appear to lend support to the emotionality hypothesis. It makes sense that EP in particular, which involves scanning the environment for affective material, would influence responses to both positive and negative emotional stimuli.

The two studies described in this Chapter aim to further examine the role of EP in attention, while attempting to cast light on the threat/emotionality debate. The face in the crowd methodology and an adapted version of this method are employed. For both studies, results are treated as being significant if probability levels are < 0.05. Results where probability levels are < 0.10 will be treated as a trend. As in Chapter 8, where trends are of relevance to the hypotheses they will be discussed further, which is in contrast to non-significant effects which will not be discussed. Trends, however, will be treated with more caution than significant results.

Study 7

As outlined above, although individuals predominantly show a bias for angry faces, the results of Study 6 provide some indication that angry and happy faces may be processed in similar ways. Study 7 uses a modified version of the face in the crowd task with schematic faces in order to further investigate the effects of EP in attentional processing. Specifically, it is designed to test the proposition that positive and negative emotions may be processed in similar ways. In order to do this, responses to various displays of angry and happy faces are compared, rather than directly comparing whether an angry face is more attention grabbing than a happy face per se. The task will therefore be able to tease apart the relative contribution of the threat and emotionality hypotheses.

The 'who's in the crowd task'

The attentional task employed in Study 7 does not involve identifying or focussing on angry faces, it simply asks the participant to decide how many types of faces are present in the display. In this case, an angry bias (or happy bias) will be reflected in slower response times to the one angry (or happy) face, because as well as seizing attention, the face holds attention. This paradigm requires the participant to move their attention away from whatever grabbed it in the first place. For example, participants who display an angry (or happy) bias will have a narrow focus of attention towards angry (or happy) faces. This focus is very narrow when there is only one angry (or happy) face present in the display and it takes time to widen the focus in order to assess the whole visual scene. If participants were simply asked to identify the *different* face in the row of three, like in the face in the crowd task, then response times to the one angry (or happy) face would be expected to be quick. Instead, participants were asked to decide whether there were one, two or three *types* of faces in each display, which required them to widen attention to the whole visual scene in order to process all the stimuli. This would be difficult to do if focussed on one angry (or happy) face, as the face grabs and hold attention before the participant is able to move on to other faces in the display. Thus the response times to the one angry (or happy) face in the 'who's in the crowd' paradigm will be slower if reflecting an angry (or happy) bias.

As discussed in Chapter 8, individuals with low EP appear to be less competent at processing the meaning of affective stimuli. This may be because they are less skilled at monitoring the affective environment, as a result of being less interested in emotional stimuli. Thus, due to a narrow focus of attention, it is predicted that individuals with low EP will show a bias for angry and happy faces, indicated by slower responses to the one angry (or happy) face.

Individuals with increasing levels of anxiety have consistently demonstrated a threat bias, so they are expected to focus attention on angry faces. However, as discussed in Chapter 8, happy faces may also represent a source of potential threat, particularly for individuals with increased levels of anxiety. Due to a bias for threat (or potential threat), individuals with increased levels of anxiety are predicted to show a bias for angry and happy faces, reflected in slower reaction times to the one angry (or happy) face.

Methods

Participants

Fifty-three (20 male, 33 female) undergraduates volunteered to participate in the Study, in exchange for course credit. The mean age was 26 years (range 18-50).

Materials

Self-report measures

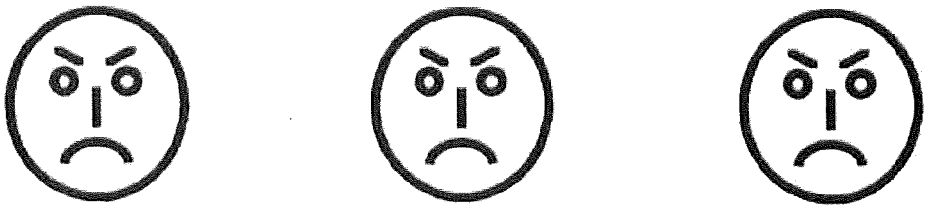
EP was assessed using the 14-item APT. Trait Anxiety was assessed using the STAI (Spielberger et al., 1983).

Attentional task

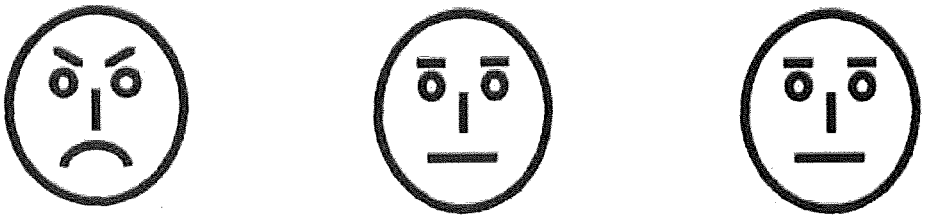
The stimuli, taken from Fox et al. (2000), were composed of three schematic faces arranged in a horizontal line (see Fig. 9.1). There were ten types of display in total. The three one expression displays consisted of three faces all displaying the same expression (all angry, all happy, all neutral). These were presented six times each giving a total of 18 displays in order to balance out the number of responses. The seven different trials consisted of either two expression or three expression displays. The two expression displays consisted of two faces expressing the same emotion and one face expressing a different emotion. All combinations of expressions were combined, making six different displays. Each different face could occur at any of the three positions in the row. Thus there were 18 two expression displays. The three expression displays consisted of three different expressions (1 angry, 1 happy, 1 neutral). Each face could occur at any of the three positions in the row. Thus there were six three expression displays. These were presented three times each, giving a total of 18 displays. The faces were drawn in black against a white background. The size of each face displayed on the computer screen was 35 x 40 mm, the distance between their inner edges was 35 mm. A full list of materials can be found in Appendix B.5-8.

Fig 9.1 Examples of stimulus displays used in Study 7. (a) All angry faces (one expression display), (b) 1 angry face, 2 neutral faces (two expression display), (c) 1 angry, 1 happy and 1 neutral face (three expression display).

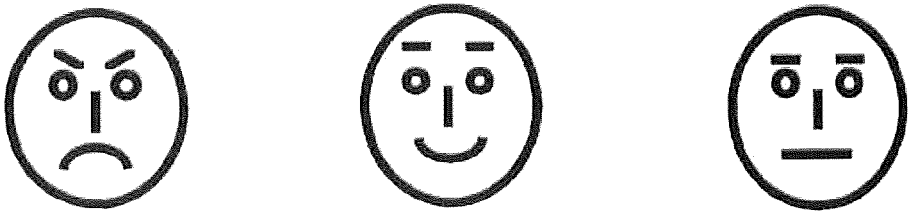
(a)



(b)



(c)



Procedure

Prior to the attentional task, each participant completed the two self-report measures. They were then seated at a comfortable distance in front of a computer and were told they were about to take part in a reaction time experiment examining how people process and attend to visual information. Each trial consisted of a central fixation cross (+) for 500 msec, which was replaced by the display of faces in a row.

Participants were then required to press one of three keys to indicate whether there were 1, 2 or 3 expressions in the display. Three fingers on the participant's right hand were used to respond with each number key. The faces remained displayed until one of the response keys were pressed. There was then an inter-stimulus interval of 500 msec before the fixation cross for the next trial was presented. There were 18 practice trials to help familiarise themselves with the procedure followed by 54 experimental trials. These were broken up into two blocks of 27 trials with the opportunity for participants to take a short break if they wished. There were nine one, nine two, and nine three expression displays in each block. Participants were encouraged to respond as quickly and accurately as possible. Presentation order was randomised within blocks.

Results

Self-report measures

Median splits were performed on both EP scores and STAI trait anxiety scores. For EP, those scoring more than the median of 71 (n = 25) were allocated to the high EP group, and those scoring 71 or less (n = 28) to the low EP group. Similarly, participants were divided into two groups according to whether or not their trait anxiety scores were less or equal to the median of 40 (n = 26) or greater than 40 (n = 27). The correlation between EP and trait anxiety scores was not significant (r = -0.20, n.s.).

Data screening

The data screening process was the same as for Study 6. No participants were removed from the data set following the screening process.

The overall mean RT was 1510 (SD = 417). To test the main hypotheses, separate analysis of angry and happy displays (in neutral backgrounds) were computed. For both analyses there were two independent groups factors; EP (high vs. low) and trait anxiety (high vs. low). These analyses were chosen as the main focus of Study 7 was to compare angry and happy displays, rather than a direct comparison of whether an angry face is processed quicker than a happy face per se.

Analyses of the angry displays

A 2x2x3 mixed ANOVA was conducted on the RT data with the two independent groups factors outlined above (EP and anxiety) and one within groups factor, number of angry faces (1 angry, 2 angry, 3 angry) within a neutral background. Table 9.1 summarises the RT data.

Table 9.1 Mean reaction time and standard deviations (in parentheses) to the angry displays (in msec).

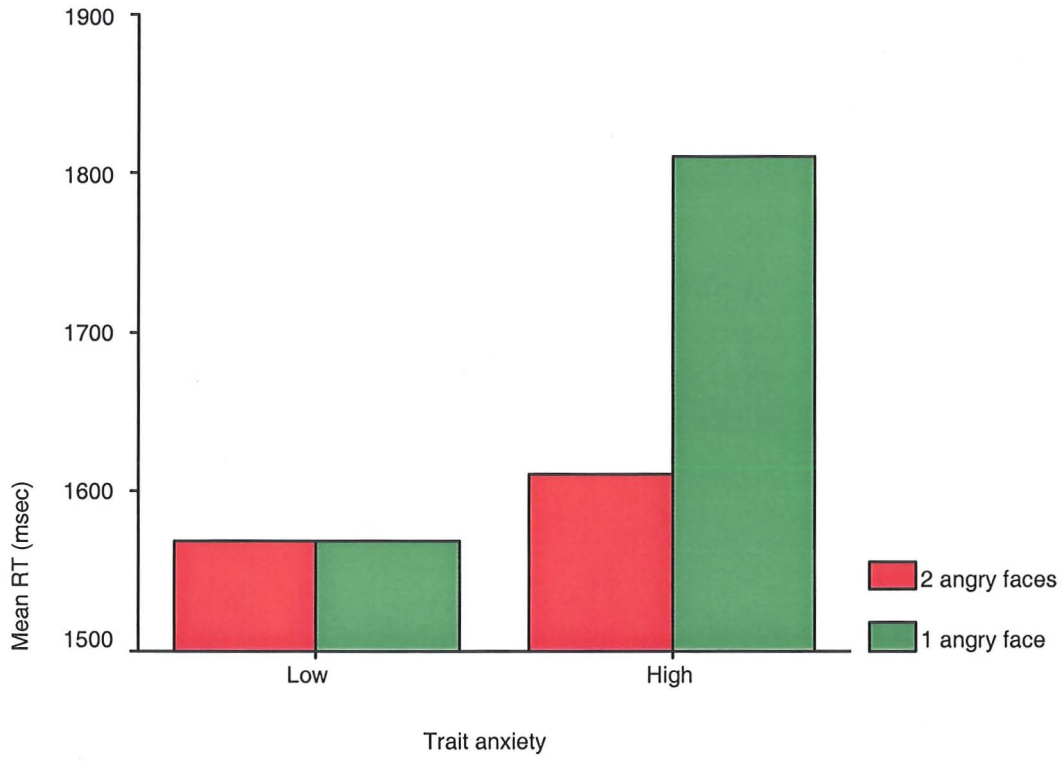
	1 angry (2 neutral) *Mean (SD)*	*2 angry (1 neutral)* *Mean (SD)*	*3 angry* *Mean (SD)*
Low trait Anxiety N=26	1568 (336)	1568 (439)	1371 (470)
High trait Anxiety N=27	1810 (322)	1610 (437)	1375 (428)
Low EP N=28	1825 (309)	1664 (495)	1419 (494)
High EP N=25	1542 (328)	1506 (345)	1323 (386)
Low EP/Low trait Anxiety N=12	1586 (449)	1623 (494)	1482 (459)
Low EP/High trait Anxiety N=16	2005 (463)	1696 (423)	1372 (339)
High EP/Low trait Anxiety N=14	1554 (213)	1523 (298)	1278 (290)
High EP/High trait Anxiety N=11	1528 (449)	1486 (446)	1381 (452)

There was a main effect for number of angry faces [$F(2,98) = 23.11$, $MSe = 49815.46$, $p < 0.05$] with Newman-Keuls post hoc comparisons indicating that 1 angry face was responded to more slowly than 2 angry faces, which were responded to more slowly than 3 angry faces. There were no main effects for either EP [$F(1,49) = 2.10$, $MSe = 530680.15$, n.s.] or anxiety [$F(1,49) = 0.37$, $MSe = 530680.15$, n.s.]. There was no two-way interaction between EP and number of angry faces [$F(2,98) = 1.66$, $MSe = 49815.46$, n.s.], but there was a two-way interaction between trait anxiety and number of angry faces [$F(2,98) = 3.13$, $MSe = 49815.46$, $p < 0.05$]. There was also a three-way interaction between number of angry faces, EP and anxiety [$F(2,98) = 7.09$, $MSe = 49815.46$, $p < 0.05$]. Full ANOVA tables for analyses of the angry displays can be found in Appendix A.7.

Simple main effects for the two-way interaction

The interaction between number of angry faces and trait anxiety is shown in Fig. 9.2. High trait anxious individuals were slowed down when locating 1 angry face in a neutral background relative to 2 angry faces in a neutral background [$F(1,26) = 9.94$, $MSe = 49815.46$, $p < 0.05$], but there was no significant difference between locating 1 or 2 angry faces for low trait anxious individuals [$F(1,25) = 0.01$, $MSe = 49815.46$, n.s]. Finally, there was no significant difference between low and high anxious individuals locating 1 angry face [$F(1,51) = 3.03$, $MSe = 49815.46$, n.s.], or 2 angry faces [$F(1,51) = 0.10$, $MSe = 49815.46$, n.s.].

Fig 9.2 Two-way interaction between number of angry faces and trait anxiety.

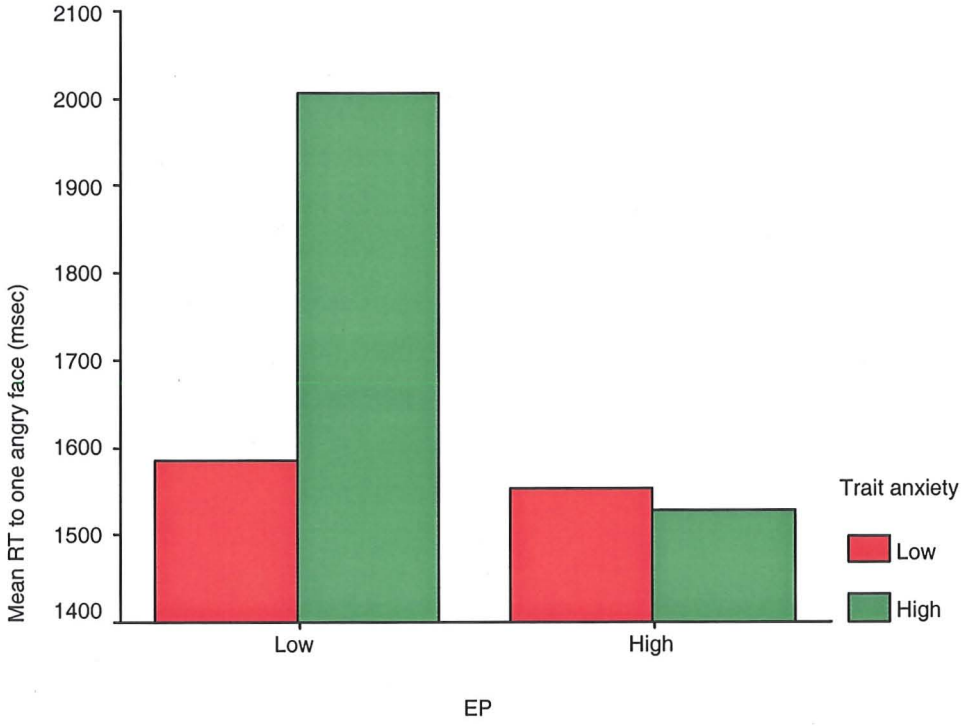


Simple main effects for the three-way interaction

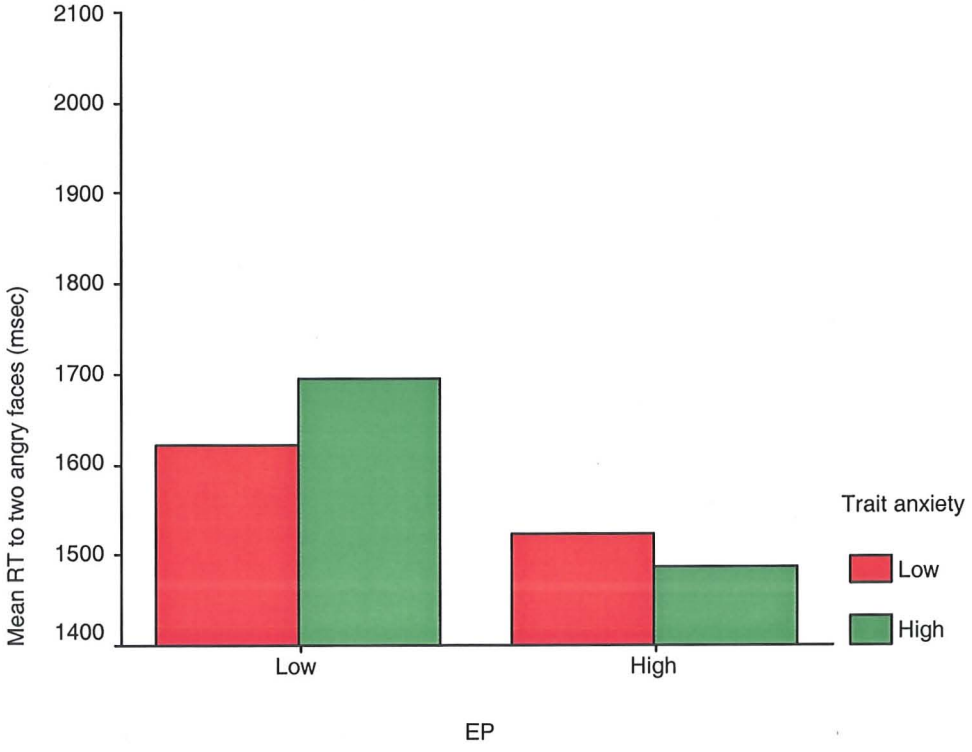
There was a significant interaction between EP, trait anxiety and number of angry faces, where a combination of low EP and high trait anxiety scores resulted in locating 1 angry face in a neutral crowd slower than 2 angry faces [$F(1,15) = 10.68$, $MSe = 49815.46$, $p < 0.05$]. This interaction is shown in Fig 9.3. There was no significant difference between locating 2 angry faces or 1 angry face for individuals with high EP and low trait anxiety [$F(1,13) = 0.12$, $MSe = 49815.46$, n.s.]; for individuals with low EP and low trait anxiety [$F(1,11) = 0.11$, $MSe = 49815.46$, n.s.], or for individuals with high EP and high trait anxiety [$F(1,10) = 0.77$, $MSe = 49815.46$, n.s.].

Fig 9.3 Three-way interaction between emotional perception, anxiety and number of angry faces, (a) for one angry face, (b) for two angry faces.

(a)



(b)



Analyses of the happy displays

A 2x2x3 mixed ANOVA was conducted on the RT data with two independent groups factors (EP and anxiety) and one within groups factor, number of happy faces (1 happy, 2 happy, 3 happy) within a neutral background. Table 9.2 summarises the RT data.

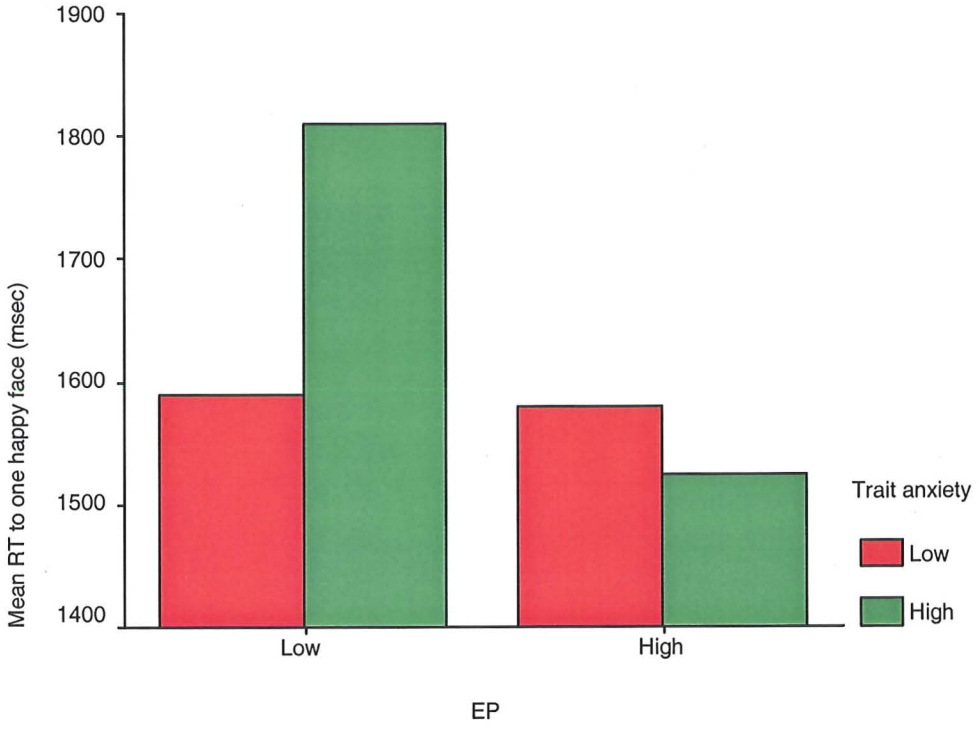
Table 9.2 Mean reaction time and standard deviations (in parentheses) to the happy displays (in msec).

	1 happy (2 neutral) *Mean (SD)*	*2 happy (1 neutral)* *Mean (SD)*	*3 happy* *Mean (SD)*
Low trait Anxiety N=26	1584 (349)	1558 (316)	1208 (371)
High trait Anxiety N=27	1693 (476)	1556 (396)	1207 (300)
Low EP N=28	1715 (468)	1621 (359)	1246 (390)
High EP N=25	1555 (344)	1486 (345)	1164 (258)
Low EP/Low trait Anxiety N=12	1590 (484)	1632 (372)	1292 (498)
Low EP/High trait Anxiety N=16	1810 (449)	1613 (362)	1212 (298)
High EP/Low trait Anxiety N=14	1579 (291)	1495 (258)	1138 (209)
High EP/High trait Anxiety N=11	1525 (484)	1474 (446)	1199 (418)

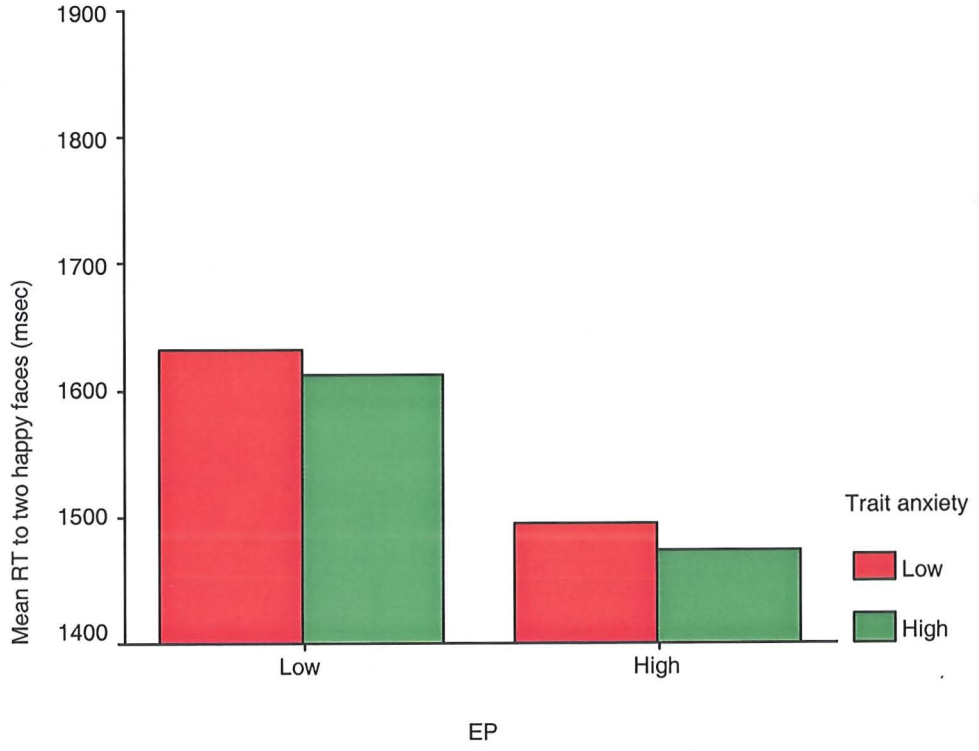
There was a main effect for number of happy faces [$F(2,98) = 50.80$, $MSe = 50433.22$, $p < 0.05$] with Newman-Keuls post hoc comparisons indicating that 1 happy face was responded to more slowly than 2 happy faces, which were responded to more slowly than 3 happy faces. There were no main effects for either EP [$F(1,49) = 1.87$, $MSe = 315717.90$, n.s.] or anxiety [$F(1,49) = 0.04$, $MSe = 315717.90$, n.s.]. There were no two-way interactions between EP and number of happy faces [$F(2,98) = 0.31$, $MSe = 50433.22$, n.s.], or between trait anxiety and number of happy faces [$F(2,98) = 0.82$, $MSe = 50433.22$, n.s.]. The three-way interaction between number of happy faces, EP and anxiety only just did not reach significance [$F(2,98) = 2.88$, $MSe = 50433.22$, n.s.], but there was a strong trend in the same direction as the angry displays, with one combination of EP and trait anxiety being significant: A combination of low EP and high trait anxiety scores resulted in locating 1 happy face in a neutral crowd slower than 2 happy faces [$F(1,15) = 4.55$, $MSe = 50433.22$, $p < 0.05$]. This interaction is shown in Fig 9.4. There was no significant difference between locating 2 happy faces or 1 happy face for individuals with high EP and low trait anxiety [$F(1,13) = 3.04$, $MSe = 50433.22$, n.s.]; for individuals with low EP and low trait anxiety [$F(1,11) = 0.18$, $MSe = 50433.22$, n.s.], or for individuals with high EP and high trait anxiety [$F(1,10) = 2.22$, $MSe = 50433.22$, n.s.]. Full ANOVA tables for analyses of happy displays can be found in Appendix A.7.

Fig 9.4 Interaction between emotional perception, anxiety and number of happy faces, (a) for one happy face, (b) for two happy faces.

(a)



(b)



Discussion

The aim of Study 7 was to further investigate the effect of EP on attentional processing. In particular to consider whether displays of angry and happy faces were processed in similar ways, in order to assess the relative contribution of the attentional threat and emotionality hypotheses.

The results of Study 7 again found a bias for angry faces for individuals with low EP and increasing levels of anxiety, as in studies 5 and 6. Importantly, there was a very similar pattern for happy faces, which almost reached significance.

In the analysis of angry faces, there was a main effect where 1 angry face was detected slower than 2 angry faces, which was slower than 3 angry faces. Individuals with increased levels of anxiety were slower to locate 1 angry face than 2 angry faces in a neutral background. There was a three-way interaction between EP, trait anxiety and number of angry faces. Specifically, a combination of low EP and increased levels of anxiety significantly slowed down the detection of the single threat face. As discussed earlier, the 'who's in the crowd' task does not involve identifying or focussing on angry faces, so in this case, an angry (or happy) bias will be reflected in slower response times to the one angry (or happy) face, because as well as seizing attention, the face holds attention.

In the analysis of happy faces, there was a main effect where 1 happy face was detected slower than 2 happy faces, which was slower than 3 happy faces. The three-way interaction between EP, trait anxity and number of happy faces did not quite reach significance, but a combination of low EP and increased levels of anxiety did slow down the detection of the single happy face.

Detection of both angry and happy faces was facilitated by a combination of low EP and increased levels of anxiety. This could be explained in terms of an emotionality hypothesis, where angry and happy faces would be expected to grab attention to the same extent. However, it seems that the effect may be more pronounced for EP than anxiety. Individuals with higher anxiety scores have demonstrated a tendancy to shift attention away from happy faces relative to neutral (Study 5), whereas individuals with low EP have shown no bias away from happy faces, just that they grab attention less than angry faces but more than neutral ones. Thus both may be vigilant for angry and happy faces, albeit for different reasons. The combined results from studies 5, 6 and 7 suggest an account where EP effects are accounted for by an emotional explanation and anxiety effects are accounted for by a threat explanation.

According to this account, individuals with low EP should demonstrate attentional biases for other emotional stimuli, such as sadness or disgust. This is

because EP mediates responses to *emotional* material in general, rather than simply material which may be potentially threatening. Individuals with increasing levels of anxiety would not be expected to show vigilance for unambiguously non-threatening faces (such as sadness or disgust). This is because the bias is specific to *threatening* or potentially threatening material, not to emotional stimuli in general. This is contrary to what the emotionality hypothesis would predict and in contrast to the prediction made for individuals with low EP.

Taking account of the hypotheses generated above, Study 8 uses the same face in the crowd technique as employed in Study 6, but substitutes the happy faces for schematic sad faces in order to evaluate the proposed account.

Study 8

Study 7 demonstrated that detection of both angry and happy faces were facilitated by a combination of low EP and increasing levels of anxiety. An account was proposed where EP effects can be explained by a general sensitivity to emotional material, whereas anxiety effects are accounted for by a threat explanation. Study 8 uses the face in the crowd technique with schematic angry, sad and neutral faces to test the explanation. The account predicts that individuals with low EP will show an attentional bias towards sad faces, whereas individuals with increasing levels of anxiety will not. Sad faces were chosen as happy, surprise and fear expressions are all potentially threatening, and disgust faces are difficult to produce schematically. A sad face is emotional, therefore should grab the attention of low EP individuals, but is not threatening, so highly anxious individuals should not find it attention grabbing.

There is a debate over whether depression effects attentional bias results (discussed in Chapter 7). Generally, biases for threatening information in depression have not been found, although people with high depression scores have demonstrated depression-congruent biases for sad faces (Hertel, 2002). However, depression scores have correlated with anxiety measures, which has consequently made it difficult to determine whether results of attentional bias for sad faces has been due to anxiety levels, depression scores or a general result of negative affect. The Hospital Anxiety Depression Scale (HADS, Zigmond & Snaith, 1983) is included as an additional measure as depression levels may represent a potential confound.

Study 8 aims to assess the validity of the new account outlined above and draw conclusions over the relative contribution of the threat and emotionality hypothesis.

Methods

Participants

Fifty (30 male, 20 female) undergraduates and members of the London fire brigade volunteered to participate in the Study. The undergraduates participated in exchange for course credit. The mean age was 28 years (range 20 - 52).

Materials

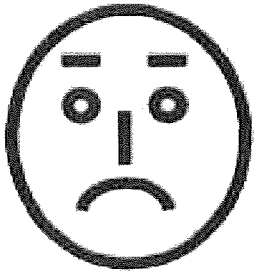
Self-report measures

EP was assessed using the 14-item APT. Trait Anxiety was assessed using the STAI. Depression was assessed using the 7-item depression sub-scale of the HADS (Zigmond & Snaith, 1983). This has a Cronbach's alpha of 0.90, good face validity and construct validity, and is convenient as it is very short.

Attentional task

The stimuli were identical to those used in Study 6 except sad faces (Fig 9.5) were substituted for happy throughout. Displays and presentation of stimuli were identical to Study 6. A full list of materials can be found in Appendix B.5-8.

Fig 9.5 A schematic sad face used in Study 8.



Procedure

Prior to the attentional task, each participant completed the three self-report measures. The procedure of the attentional task was identical to that of Study 6.

Results

Self-report measures

Median splits were performed on the EP scores, STAI trait anxiety scores and HADS scores. For EP, those scoring more than the median of 71 (n = 26) were allocated to the high EP group, and those scoring 71 or less (n = 24) to the low EP group. Similarly, participants were divided into two groups according to whether or not their trait anxiety scores were less than or equal to the median of 40 (n = 26) or greater than 40 (n = 24). Finally, for the HADS, those scoring more than the median of 5 (n = 24) were allocated to the high depression group, and those scoring 5 or less (n = 26) to the low depression group. The correlation between EP and trait anxiety scores was not significant (r = 0.12, n.s.), neither was the correlation between EP scores and depression (r = 0.03, n.s.), nor the correlation between trait anxiety and depression scores (r = 0.14, n.s.).

Power

It is noted that the cell sizes in Study 8 were lower than desirable, therefore the power of the study was somewhat reduced.

Data screening

Data were screened in the same way as for Study 6. This resulted in no participants being removed from the data set.

The overall mean RT was 1340 (SD = 287). Due to the unbalanced design, separate analyses were computed for 'same' trials and for 'different' trials. For both analyses there were three independent groups factors; EP (high vs. low), trait anxiety (high vs. low), and depression (high vs. low).

Analyses of the *same* displays

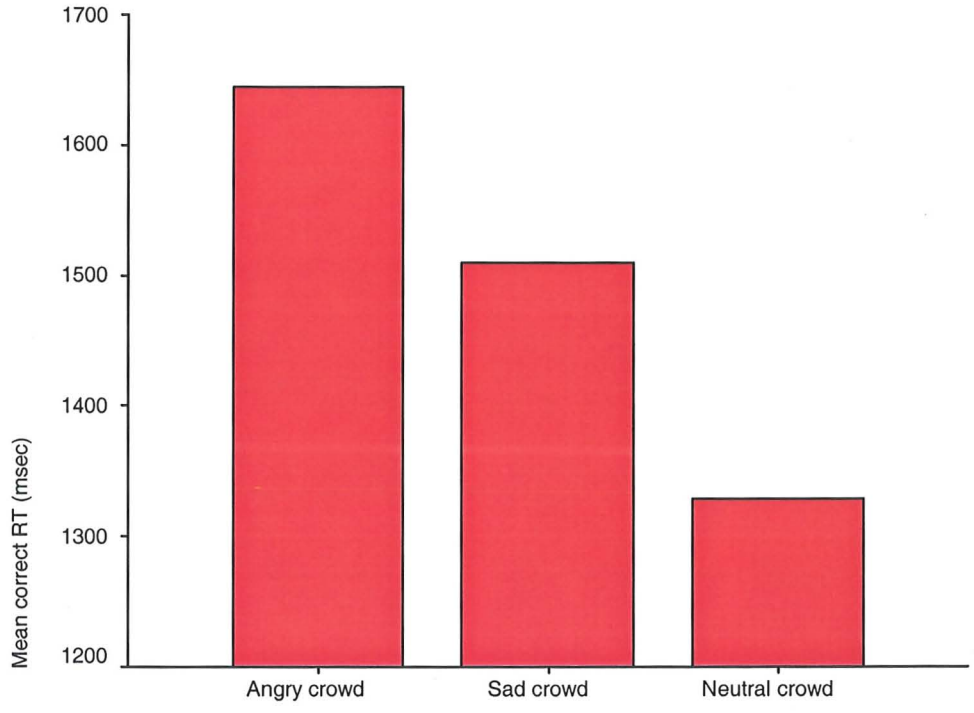
A 2x2x2x3 mixed ANOVA was conducted on the RT data with the three independent groups factors outlined above (EP, anxiety, and depression) and one within groups factor, type of crowd (all angry, all sad, all neutral). Table 9.3 summarises the RT data.

Table 9.3 Mean reaction time and standard deviations (in parentheses) to the 'same' displays (in msec).

	Angry crowds *Mean (SD)*	*Sad crowds* *Mean (SD)*	*Neutral crowds* *Mean (SD)*
Low trait anxiety N=26	1629 (381)	1509 (310)	1367 (307)
High trait anxiety N=24	1660 (320)	1510 (356)	1288 (340)
Low EP N=24	1590 (349)	1463 (305)	1317 (308)
High EP N=26	1693 (350)	1552 (351)	1339 (341)
Low depression N=26	1683 (389)	1577 (318)	1423 (319)
High depression N=24	1601 (304)	1435 (331)	1226 (309)
Low EP/Low trait anxiety/Low depression N=7	1556 (370)	1500 (367)	1499 (255)
Low EP/Low trait anxiety/High depression N=6	1704 (301)	1540 (286)	1389 (380)
Low EP/High trait anxiety/Low depression N=5	1720 (328)	1495 (388)	1217 (302)
Low EP/ High trait anxiety/High depression N=6	1408 (212)	1318 (274)	1119 (279)
High EP/Low trait anxiety/Low depression N=8	1748 (317)	1648 (222)	1428 (287)
High EP/Low trait anxiety/High depression N=5	1451 (268)	1262 (207)	1059 (205)
High EP/High trait anxiety/Low depression N=6	1716 (363)	1643 (360)	1502 (333)
High EP/High trait anxiety/High depression N=7	1787 (294)	1572 (340)	1301 (349)

There was a main effect for type of crowd [$F(2,84) = 19.08$, $MSe = 66749.13$, $p < 0.05$] with Newman-Keuls post hoc comparisons indicating that angry crowds were responded to more slowly than sad crowds, which were responded to more slowly than neutral crowds (Fig 9.6). There were no other main effects or interactions. Full ANOVA tables for analyses of the same displays can be found in Appendix A.4.

Fig 9.6 Mean reaction times for the same crowd displays.



Analyses of the *different* displays

A 2x2x2x2 mixed ANOVA was conducted on the RT data with the three independent groups factors outlined above (EP, anxiety, and depression) and one within groups factor, type of target (angry in neutral crowd, sad in neutral crowd). Table 9.4 summarises the RT data. Analyses were conducted for a neutral face in an angry/sad crowd but results were non-significant so are not discussed further.

Table 9.4 Mean reaction time and standard deviations (in parentheses) to the 'different' displays (in msec).

	Angry face (neutral crowd) *Mean (SD)*	*Sad face (neutral crowd)* *Mean (SD)*
Low trait anxiety	1175 (248)	1226 (270)
High trait anxiety	1032 (226)	1218 (201)
Low EP	1064 (252)	1090 (258)
High EP	1145 (249)	1344 (235)
Low depression	1117 (239)	1282 (242)
High depression	1094 (272)	1157 (218)
Low EP/Low trait anxiety/Low depression N=7	1162 (167)	1094 (138)
Low EP/Low trait anxiety/High depression N=6	1133 (194)	1041 (158)
Low EP/High trait anxiety/Low depression N=5	1017 (131)	1191 (193)
Low EP/ High trait anxiety/High depression N=6	1100 (169)	1053 (151)
High EP/Low trait anxiety/Low depression N=8	1201 (150)	1504 (146)
High EP/Low trait anxiety/High depression N=5	1202 (198)	1190 (200)
High EP/High trait anxiety/Low depression N=6	1039 (122)	1285 (143)
High EP/High trait anxiety/High depression N=7	1131 (198)	1323 (212)

There was a main effect for type of target [$F(1,42) = 12.61$, $MSe = 23093.36$, $p < 0.05$] with angry faces being detected more quickly than sad faces in neutral crowds, and no main effects for either EP [$F(1,42) = 3.84$, $MSe = 31734.52$, n.s.], anxiety [$F(1,42) = 3.31$, $MSe = 31734.52$, n.s.], or depression [$F(1,42) = 2.97$, $MSe = 31734.52$, n.s.]. There was an interaction between EP and type of target [$F(1,42) = 5.62$, $MSe = 23093.36$, $p < 0.05$], and an interaction between trait anxiety and type of target [$F(1,42) = 6.18$, $MSe = 23093.36$, $p < 0.05$]. There was no interaction between depression and type of target [$F(1,42) = 3.16$, $MSe = 23093.36$, n.s.]. The remaining three-way and four-way interactions between type of target, EP, anxiety and depression did not reach significance. Full ANOVA tables for analyses of the different displays can be found in Appendix A.4.

Simple main effects for EP

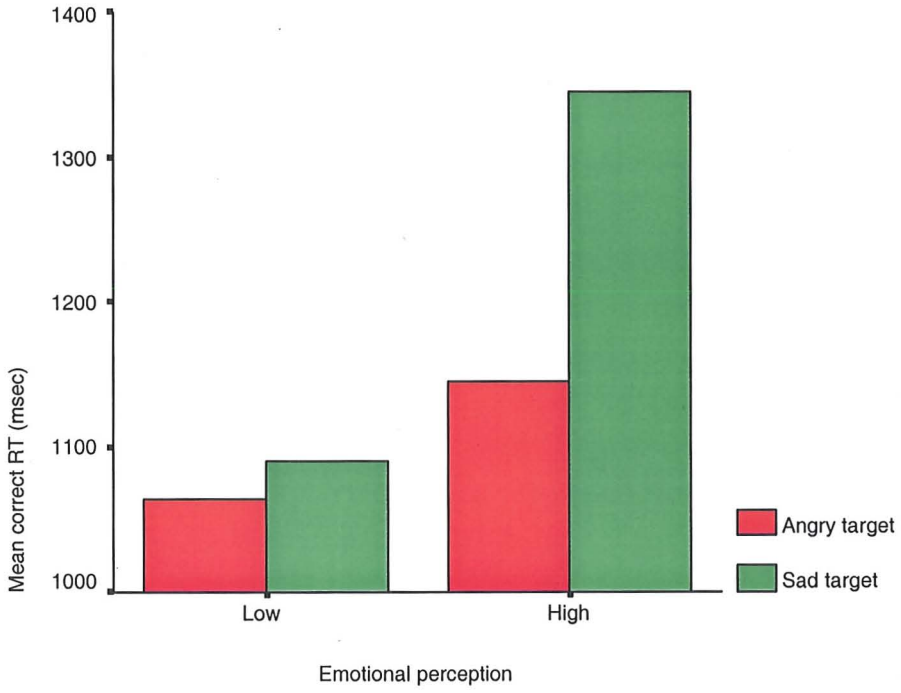
The interaction between type of target and EP is presented in Fig 9.7(a). Individuals with low EP were faster at locating an angry face in a neutral crowd than individuals with high EP [$F(1,24) = 5.80$, $MSe = 23093.36$, $p < 0.05$], and individuals with low EP were also faster at locating a sad face in a neutral crowd than individuals with high EP [$F(1,24) = 12.50$, $MSe = 23093.36$, $p < 0.05$.]. Individuals with high EP were faster at locating an angry face in a neutral crowd than a sad face in a neutral crowd [$F(1,25) = 16.45$, $MSe = 23093.36$, $p < 0.05$.], but for individuals with low EP, the difference between locating a discrepant angry or sad face in a neutral crowd did not reach significance [$F(1,23) = 0.32$, $MSe = 23093.36$, n.s.].

Simple main effects for anxiety

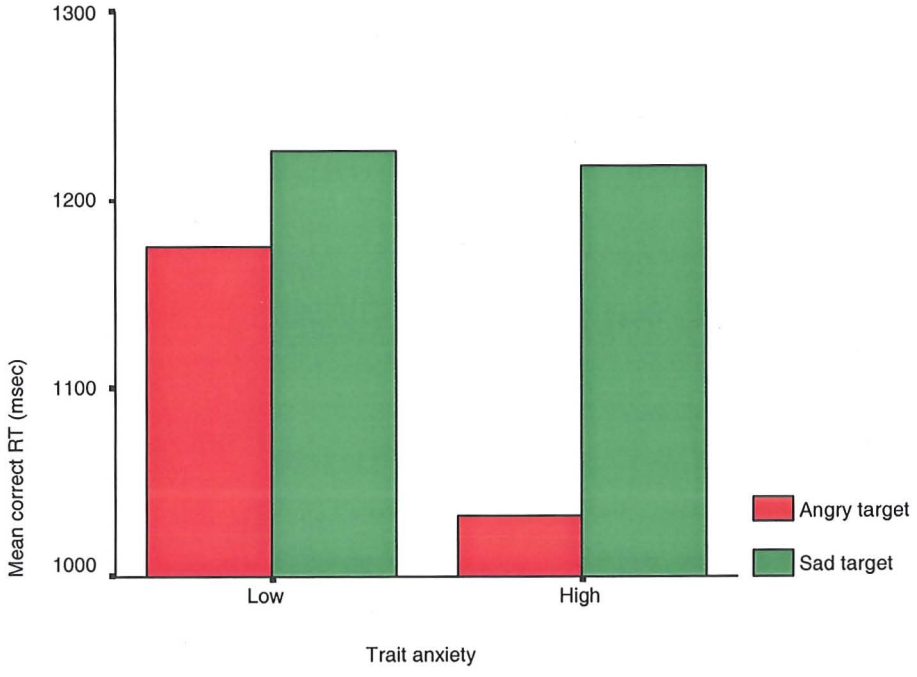
The interaction between type of target and trait anxiety is shown in Fig 9.7(b). High trait anxious individuals were faster at locating an angry face in a neutral crowd than low anxious individuals [$F(1,48) = 12.99$, $MSe = 23093.36$, $p < 0.05$], but there was no significant difference between low and high anxious individuals finding a sad face in a neutral crowd [$F(1,48) = 0.10$, $MSe = 23093.36$, n.s.]. High trait anxious individuals were faster at locating an angry face in a neutral crowd than a sad face in a neutral crowd [$F(1,23) = 14.77$, $MSe = 23093.36$, $p < 0.05$], but for low trait anxious individuals, the difference between locating an angry and sad face in a neutral crowd did not reach significance [$F(1,25) = 0.92$, $MSe = 23093.36$, n.s.].

Fig 9.7 Mean reaction times for the different displays involving interactions between (a) emotional perception and type of target and (b) trait anxiety and type of target. Both angry and sad targets are relative to a neutral crowd.

(a)



(b)



Discussion

The aim of Study 8 was to modify the original face in the crowd technique used in Study 6, to include sad instead of happy faces, in order to test the prediction introduced at the end of the discussion for Study 7. The account predicts that the effects of EP can be explained by a general sensitivity to emotional material, so individuals with low EP will show an attentional bias towards sad faces as well as angry faces. Additionally, it predicts that the effects of anxiety can be explained by the threat hypothesis, so individuals with increasing levels of anxiety will only show an attentional bias towards angry faces but not sad faces.

The results of Study 8 found a threat bias for individuals with a combination of low EP and increased levels of anxiety, as in studies 5, 6 and 7, indicating that a less than desirable level of power was not a major concern. Furthermore, support for the account was found. When displays were all the same, people were slower (i.e., more distracted) when detecting angry rather than sad or neutral crowds, indicating that angry faces hold attention for all individuals. When displays contained a different face, participants were faster to detect a different angry rather than sad face in a background of neutral faces, once again demonstrating an overall superiority of threat stimuli.

Individuals with low EP were faster at locating a discrepant angry face and a discrepant sad face in a neutral crowd than individuals with high EP; and high EP individuals were faster at locating an angry face in a neutral crowd than a sad face in a neutral crowd. These results can be explained in terms of a general sensitivity to emotional material.

Individuals with increased levels of anxiety were significantly faster at locating an angry face in a neutral crowd than individuals with low trait anxiety; and individuals with increased levels of anxiety were also faster at locating an angry face in a neutral crowd than a sad face in a neutral crowd. These results are explained in terms of a threat hypothesis.

A controversial issue in the research is whether depression is associated with an attentional bias for negative information that corresponds to the bias found in anxiety. Anxiety and depression overlap cognitively and may therefore be expected to show similar patterns of attentional bias. Study 8 failed to find any evidence to suggest that depression is associated with attentional bias for negative information. This is in line with several other studies (see Chapter 7), and suggests depression may be associated with a bias in later aspects of processing, or not associated with the processes assessed by certain attentional tasks, such as the face in the crowd technique (discussed in Chapter 7).

As in studies 5, 6 and 7, a combination of low EP and increasing levels of anxiety are involved in attentional bias for threat stimuli. Once again, the lack of correlation between the two indicates their mechanisms are likely to be different. Support was found for an account suggesting that the effects of EP can be explained by a general sensitivity to emotional material and effects of anxiety can be explained via a threat mechanism.

General discussion

This section discusses in more detail the results of the two studies described in Chapter 9. It also integrates the findings from the studies reported in Chapter 8, in order to draw some more general conclusions from the four studies. Overall, although there were differences across the results of the four studies, considering the variety of methodological approaches, they were remarkably consistent.

Special significance of threat stimuli

A consistent pattern to emerge across all four studies was the fact that angry faces seemed to hold a special significance for all individuals. Across all the studies, the effects for angry faces were the most pronounced, regardless of the method used. This is to be expected in light of previous research suggesting that people preferentially attend to negative/threatening stimuli in the environment, which is generally termed the *threat* hypothesis (discussed in Chapter 7).

Previous research is not always clear about whether this bias refers specifically to threat material, or to negative material in general, but there is some evidence from the results of the final study to suggest that attentional biases may occur for negative material in general. In Study 8, angry faces grabbed attention significantly faster than sad faces for individuals with high EP, demonstrating a general preference for threat material. However, for individuals with low EP, angry faces did not grab attention significantly faster than sad faces. This is in contrast to Study 6, where angry faces grabbed attention significantly faster than happy faces for individuals with low EP. This cannot be attributed to methodological differences, as both studies employed the same method of the face in the crowd technique. Like angry faces, sad faces are negative, and this difference between the two studies may reflect the fact that negative material jumps out more than positive material, which has been suggested in the literature (see Chapter 7).

Across the four studies, individuals mostly showed a preference towards angry faces. However, it seems that attention may be directed towards negative information

rather than positive information in general. It makes sense for individuals to respond quickly to potentially threatening/negative material in the environment before responding to positive material, which represents less of a potential danger.

The influence of emotional perception to attentional processing

This section is primarily concerned with explaining the influence of EP in attentional processing to emotionally meaningful stimuli. The effects of anxiety are also considered as there are robust findings for the influence of anxiety on attentional processing towards threat stimuli. Over the course of the four studies, support was found for an account where the effects of EP were explained by a general senstivity to emotional material, and anxiety effects were were accounted for by a threat explanation. Consistent throughout the four studies was the combination of low EP and increasing levels of anxiety resulting in a bias for angry faces. The results are summarised in Table 9.5.

Table 9.5 Summary of the results across the four studies for emotional perception (EP) and trait anxiety (TA). All results are significant unless otherwise indicated.

	Attentional bias for angry faces	**Attentional bias for happy faces**	**Attentional bias for sad faces**
Study 5	Low EP High TA	Low TA	N/A
Study 6	Low EP High TA	Low EP High TA (Pattern of mean RT's)	N/A
Study 7	Low EP High TA	Low EP High TA (Strong trend)	N/A
Study 8	Low EP High TA	N/A	Low EP

The results from the two studies described in Chapter 8 generally supported the threat hypothesis with a combination of low EP and increased levels of trait anxiety resulted in a bias for angry faces. In Study 5, attentional biases towards angry faces were only found for individuals who were low in EP and also had increasing

levels of anxiety (see Chapter 8 for a full discussion of these results). In Study 6, detection of threat was facilitated for individuals with low EP and individuals with increased levels of trait anxiety. There was also some tentative evidence to suggest that angry and happy faces may be processed in a similar way (see Chapter 8 for a full discussion of these results).

In Study 7, a bias for angry faces was once again demonstrated by a combination of low EP and higher levels of anxiety as in studies 5 and 6. In the analysis of angry faces, there was a three-way interaction where a combination of low EP and increased levels of anxiety significantly slowed down the detection of the single angry face. Importantly, the suggestion that angry and happy faces may be processed in similar ways was supported in Study 7. The analysis of happy faces closely followed the pattern for angry faces where a combination of low EP and higher anxiety individuals were slowed down when detecting the single happy face. Furthermore, the three-way interaction between EP, anxiety and happy faces almost reached significance. As discussed earlier, the 'who's in the crowd' task does not involve identifying or focussing on angry faces, so in this case, an angry (or happy) bias will be reflected in slower response times to the one angry (or happy) face, because as well as seizing attention, the face holds attention.

As discussed earlier in this Chapter, detection of both angry and happy faces was facilitated by a combination of low EP and increased levels of anxiety. This resulted in the development of an account where EP effects could be explained by emotional sensitivity and anxiety effects by a threat explanation.

Individuals with low EP show a significant bias towards angry faces and a strong trend towards a bias for happy faces. It is proposed that this result can be explained in terms of a general sensitivity for emotional material. Individuals with low EP may be less affected by emotional stimuli and therefore less interested in surveying the emotional landscape. They may consequently have difficulty reading the emotions of others' and reacting accordingly. Thus in Study 7, the one angry (or happy) face grabs and holds their attention, due to their narrow visual focus, and they are not interested in surveying the rest of the visual scene which may contain other emotional stimuli. In contrast, individuals with high EP are more skilled at surveying the emotional landscape and interpreting the meaning of emotional material. Thus they may take more time surveying the whole scene with a wider visual focus. As a result, individuals with high EP do not necessarily have their attention grabbed and held by one angry or happy face. They process the rest of the visual scene in case there are other emotional stimuli present. According to the account outlined earlier, individuals with low EP should respond quicker to other emotional stimuli, such as sadness or disgust.

Individuals with increasing levels of anxiety show a significant bias towards angry faces and a strong trend towards a bias for happy faces, which would appear to provide support for the emotionality hypothesis. However, it is suggested that these individuals are sensitized to threat, providing a threat-vigilant style with an increased perception of danger in the environment, whether real (in the case of the angry face) or imagined (in the case of a happy face where a smile may appear threatening). If this theory is correct, individuals with increasing levels of anxiety would not be expected to show vigilance for unambiguously non-threatening faces (such as sadness or disgust), which is contrary to what the emotionality hypothesis would predict and in contrast to the prediction made for individuals with low EP.

The results of Study 8 found a threat bias for individuals with a combination of low EP and increased levels of anxiety, as in studies 5, 6 and 7. Furthermore, support for the account outlined above was found.

Individuals with low EP demonstrated a bias towards angry and sad faces, particularly when locating a discrepant angry or sad face in a neutral crowd. This result was predicted by the account outlined above and is in line with the results of Study 6, where individuals with low EP responded quickly to a different angry face in a neutral crowd. It seems counter-intuitive that individuals with low EP are better at the face in the crowd task. However, as discussed in Study 6, individuals with low EP are less affected by emotional stimuli so can respond more quickly treating the task as a traditional visual search exercise. Thus the results of Study 8 support the account that EP effects can be explained by a general sensitivity to emotional material, rather than by a threat explanation. Individuals with low EP show a bias (i.e., respond quickly) to sad faces, yet another type of emotional stimuli which are unambiguously non-threatening. Individuals with high EP are more sensitive to emotional material so dwell longer on emotional information.

Individuals with increasing levels of anxiety showed a bias towards threat stimuli, particularly when locating a different angry face in a neutral crowd. This is supported by much of the literature (e.g., Byrne & Eysenck, 1995; Mogg & Bradley, 1999b) and is consistent with the findings of studies 5, 6 and 7. Individuals with lower levels of anxiety also show preference for angry stimuli, just to a lesser extent. Individuals with increased levels of anxiety showed a bias towards angry faces, and in Study 7, also showed a bias towards happy faces. This seemingly provides support for the emotionality hypothesis, which suggests that positive and negative emotional stimuli capture attention to the same extent. However, in Study 8, individuals with increasing levels of anxiety showed no bias for sad faces, which is contrary to what the emotionality hypothesis would predict. In terms of a threat explanation, highly anxious individuals are sensitised to threat whether real (in the case of the angry face)

or imagined (in the case of a happy face where a smile may appear threatening). Consequently, they would not be expected to show bias towards unambiguously non-threatening faces (such as sadness). Thus, the results of Study 8 lend support to the claim that anxiety effects can be explained in terms of a threat hypothesis.

To summarise, individuals with low EP seem to be quicker in so many studies, which may be because they are less interested in emotional material (discussed in Chapter 8). This raises a suggestion that EP may also incorporate an element of emotional sensitivity. Although speculative, this idea is discussed further in Chapter 10.

Anxiety: Interaction hypothesis Vs Cognitive-motivational theory

Athough not the major focus of the four studies, some consideration was given to determining which cognitive theory offered the best account of anxiety. The relationship between anxiety and attention is complex and the review in Chapter 7 was selective when discussing various theoretical alternatives. However, two established theories which have divided the literature for a number of years were considered in more detail. The interaction hypothesis (Williams et al., 1988; 1997) of anxiety predicts that high trait anxious individuals should become more vigilant, and low trait anxious individuals more avoidant of threat (see Chapter 7). In contrast, the cognitive-motivational theory (Mogg & Bradley, 1998) predicts that all individuals, including those with low trait anxiety, should be more vigilant for high rather than mild threat stimuli (discussed in Chapter 7). Overall, the combined results of the four studies suggest that the cognitive-motivational theory offers a better account of anxiety than the interaction hypothesis.

The results of Study 5 appeared to lend support to the interaction hypothesis, but for various methodological reasons (see Chapter 8), the results were inconclusive.

In studies 6 and 7, arguably using more ecological stimuli in the form of schematic faces, both high and low anxious individuals showed a bias towards the detection of angry faces. The bias for low anxious individuals was significantly less pronounced than that for high anxious individuals but demonstrates that all individuals tend to focus on threat stimuli, lending support to the cognitive-motivational theory.

The results of Study 8 also support the cognitive-motivational theory in terms of the results for anxiety and depression. In terms of anxiety, low anxious individuals once again showed a bias towards angry faces, even though it was far less pronounced than for individuals with high anxiety. Furthermore, the fact that depression did not seem to be associated with attentional bias for negative information in initial orienting

lends further support to the cognitive-motivational theory. The interaction theory of anxiety (Williams et al., 1988; 1997), suggests that anxiety and depression are associated with different patterns of cognitive bias. However, the specific mechanisms responsible for such biases are unclear. The absence of biases in initial orienting in clinical depression is unexpected from this theory, given the high levels of anxiety often found in clinically depressed individuals. However, such findings can be interpreted in terms of the cognitive-motivational theory. This approach proposes that initial orienting processes depends on two mechanisms: one involved in the appraisal of the negative valence of the stimuli, and the other determining behaviour towards external goals and stimuli. Therefore, although depression seems likely to be associated with a negative bias in the appraisal of emotional stimuli this is not reflected in initial orienting mechanisms. Mogg & Bradley (1998) have suggested that the absence of biases in initial orienting to external negative stimuli may be due to depression impairing, or lowering the level of functioning of, the goal engagement system, reflecting a general deficit in external goal-orientated behaviour.

To summarise, although not the main concern of the studies, the results generally lend support to the cognitive-motivational theory being a more accurate account of anxiety than the interaction hypothesis.

To conclude, although there were differences in the results across the series of studies, considering the variety of methodological approaches employed, they were remarkably consistent. As discussed above, threatening/negative material does seem to hold a special significance for all individuals as the effects for angry/sad faces were the most pronounced. Over the course of the four studies, support was found for an account where the effects of EP can be explained by a general sensitivity to emotional material and the effects of anxiety can be explained by a threat hypothesis. Athough not the major focus of the studies, some consideration was given to determining which cognitive theory offered the best account of anxiety. Overall, the combined results suggest that the cognitive-motivational theory offers a better account of anxiety than the interaction hypothesis.

The following Chapter draws together the overall conclusions from the thesis. First the results of the empirical chapters are summarised. Second, the questions that were raised in Chapter 2 are re-considered. It is evaluated to what extent these have been answered, if there are any alternative explanations for the results, and what work remains outstanding.

Chapter 10

Conclusions

"All yet seems well; and if it ends so meet,
The bitter past, more welcome is the sweet."

All's well that ends well, Act 5 Scene 5

This Chapter begins by summarising the results of the six empirical chapters (chapters 2, 4, 5, 6, 8 and 9). It then looks back at the questions that were raised in Chapter 2 and evaluates to what extent these have been answered, and what work remains outstanding.

Summary of empirical work

The status and measurement of an emotional perception component within emotional intelligence

Study 1, reported in Chapter 2, described the construction and validation of a short self-report measure of EP. Principal Components Analysis (PCA) of the APT suggested a unitary component solution. Scores showed good internal reliability coefficients, and eight-week test-retest reliability indicated that scores were stable over time. The scale showed evidence of construct validity. Women scored significantly higher than men on the APT, a finding that is consistent with previous research on sex differences in the perception of emotion (e.g., Ciarrochi et al., 2000; Mayer & Geher, 1996). Also, scores on the APT were related to an objective measure of EP. The scale showed evidence of discriminant validity as scores on the APT were not significantly related to scores on the Affective Communication Test (ACT, Friedman et al., 1980). From these results, it was concluded that the APT offered the potential to measure EP in addition to objective measures, if further reliability and validity evidence could be obtained.

Reliability, validity and correlations of emotional perception with other variables

Studies 2 and 3, described in Chapter 4, considered the relationship between EP and theoretically relevant variables within the EI framework using two different samples. In general, the findings were consistent across both samples. The results provided additional support for the reliability and validity of the APT. PCA of the APT suggested a unitary component solution and scores showed good internal

reliability coefficients. In terms of construct validity, women scored higher than men on the APT, and the APT correlated with the EI scales of emotional clarity, emotional awareness and emotional expression. The magnitude of these correlations were small to moderate, which was to be expected in light of previous research which has conceptualised EI as being a set of related abilities (e.g. Davies et al., 1998; Goleman, 1995; Salovey & Mayer, 1990). The APT also showed small to moderate correlations with the theoretically relevant variables of well-being and coping. The scale showed evidence of discriminant validity. In comparison with the other EI scales, the APT showed the lowest correlations with both personality dimensions and verbal IQ. This demonstrates the independent status of EP over and above these variables. These results demonstrate that EP represents a semi-independent ability within the EI construct.

Predictive validity of emotional perception and change across time

Chapter 5 described further results from studies 2 and 3 in order to assess the relationship between EP and various aspects of performance. Additionally, changes in scores across time were considered for all measures. In terms of predictive validity, APT scores predicted seminar presentation grades and nursing grades more strongly than other EI components, personality, verbal IQ, well-being and coping variables. EP appears to demonstrate predictive validity, particularly when performance involves practical skills. It appears that EP predicts performance in terms of communication/practical ability rather than academic achievement per se. In terms of changes over time, scores on EI measures changed over the 6-month time gap between testing phases for both samples, indicating that EI variables are adaptive. It also suggests that EI is more of an ability than a stable trait. Although EP appears to be semi-independent, as demonstrated in Chapter 4, and these results suggest that the APT is potentially useful with long-term effects, the longitudinal studies cannot assess the role of EP in actual behaviour due to their questionnaire-based nature.

Emotional perception in the social environment

Previous empirical work, described above, relied on questionnaire data, which makes it impossible to address the question of whether EP has behavioural outcomes. As a result, Study 4, described in Chapter 6, used a quasi-experimental design to evaluate the role of EP in social interaction. Specifically, the study investigated the effects of EP in a social environment by using ratings of embarrassment during class presentations, and the degree to which target levels of EP, expressivity and empathy predict these. The results indicated that audience members could accurately identify embarrassment in live, naturalistic settings, and that EP and expressivity both

contribute to embarrassment ratings with EP having more of an influence over presenters' embarrassment ratings of themselves, and expression influencing audience embarrassment ratings of presenters. Empathy had no effect on embarrassment ratings. Study 4 demonstrated that EP had reliable interpersonal effects in a social environment, and participants were provided with some useful feedback about internal and external judgements of embarrassment. Furthermore, Study 4 investigated the suggestion (raised in Chapter 5), that EP may influence practical performance. Indeed, EP proved to play an important role in interpersonal perceptions of embarrassment, but still left unanswered was the question of whether EP would effect the moment-by-moment regulation of behaviour.

The role of emotional perception in the focus of attention to emotionally meaningful stimuli

Studies 5 and 6, described in Chapter 8, used experimental methodologies within the attentional bias framework to investigate how EP may direct and maintain attention to emotionally meaningful stimuli. Study 5 employed the dot probe methodology with photographs from the Ekman series of faces to consider whether attentional biases for emotional faces, which has been reported to be influenced by anxiety, is also mediated by EP. The results showed a threat bias for participants with low scores on EP, but only those who also had increased levels of anxiety. Individuals with low EP tend to be less skilled at surveying the emotional landscape and may be less interested in emotional stimuli. As a result, they may have difficulty determining whether threat is real or imagined, so are likely to focus on an angry face in case it is important. Increasing levels of anxiety may sensitise the individual to threat, providing a threat-vigilant style with an increased perception of danger in the environment. Thus for different reasons, low EP and increasing levels of anxiety lead to an accentuation of the normal threat bias (discussed in Chapter 8). Several limitations of using the dot probe task were identified (see Chapter 8), including the problem of controlling for visual features when using real faces.

Study 6 used the face in the crowd paradigm with schematic faces taken from Fox et al. (2000) to further examine the contribution of EP to attentional processing. There was a threat bias for individuals with low EP and individuals with increasing levels of anxiety. It appeared to be somewhat counter-intuitive that individuals with low EP did *better* at the face in the crowd task. However, it was suggested that individuals with low EP are less affected by the emotional content of the stimuli. They can treat the task as a traditional visual search exercise and can therefore respond more quickly to an angry face in a neutral crowd. On the other hand, individuals with high EP are more affected by emotional stimuli, so take longer to do

the visual search task. Additionally, there was some tentative evidence from the data to suggest that happy stimuli may be processed in a similar way to angry stimuli, which would seem to suggest a general sensitivity to emotional material. It was suggested that this may be the case for low EP individuals, who have an overall difficulty processing emotional stimuli, which is likely a result of lack of interest in the material in the first place. In contrast, anxiety effects were still explained by the threat hypothesis, as happy faces may also appear to be potentially threatening, particularly for highly anxious individuals who may fear social ridicule and being laughed at (discussed in Chapter 8). Given the tentative evidence from Study 6 suggesting happy faces may be processed in a similar way to angry faces, it was concluded that similarities in processing between emotionally meaningful stimuli should be investigated.

The effect of emotional perception in attentional processing: General sensitivity to emotional material

Studies 7 and 8, reported in Chapter 9, further examined the role of EP in attentional processing, while attempting to cast light on the threat/emotionality debate. Study 7 used a modified version of the face in the crowd task with schematic faces in order to tease apart the relative contribution of the threat and emotionality hypotheses. Detection of both angry and happy faces was facilitated by a combination of low EP and increased levels of anxiety. Initially, this appears to be in line with the emotionality hypothesis, where angry and happy faces would be expected to grab attention to the same extent. However, it seems that the effect may be more pronounced for EP than anxiety. Individuals with higher anxiety scores have demonstrated a tendency to shift attention away from happy faces relative to neutral (Study 5), whereas individuals with low EP have shown no bias away from happy faces, just that they grab attention less than angry faces but more than neutral ones. Thus both may be vigilant for angry and happy faces, albeit for different reasons. An account was proposed where EP effects could be accounted for by an emotional explanation and anxiety effects accounted for by a threat explanation (discussed in Chapter 9).

Study 8 used the same face in the crowd technique as employed in Study 6, but substituted the happy faces for schematic sad faces in order to evaluate the new account proposed. According to this account, a sad face is emotional, therefore should grab the attention of low EP individuals, but is not threatening, so highly anxious individuals should not find it attention grabbing. Support for the account was demonstrated as low EP individuals showed a bias toward both angry and sad faces,

whereas individuals with increasing levels of anxiety only demonstrated an attentional bias for angry faces but not sad faces (discussed in Chapter 9).

Answering the questions

This section refers to the questions asked in Chapter 2 to evaluate how far we have come in answering them and make suggestions for future research.

1. What is emotional perception?

EP is the ability to perceive emotion in others, which has been identified as one of the core elements in many conceptualisations of EI (e.g., Davies et al., 1998; Martinez-Pons, 1997; Mayer & Geher, 1996; Salovey & Mayer, 1990). Indeed, once the influences of personality and cognitive ability are accounted for, one of the only aspects of EI which remains as an identifiable construct is EP. It seems natural to theorise that other aspects of EI all depend on EP. The mediation, use and modification of emotions in oneself and others depends in the first instance on the individual's ability to actually perceive these emotions.

Studies 2 and 3 demonstrated that EP shared a small but significant correlation with verbal IQ as expected, plus EP scores changed across time. These results suggest that EP is more likely to be an *ability*, than a stable *trait* like personality. This lends support to the claim (Mayer et al., 1999) that EI components (or at least EP) are part of an information-processing framework.

2. How important is it?

This thesis has demonstrated that EP has an important role to play in three main theoretical areas. First, it has been shown to influence performance and longitudinal effects (studies 2 and 3). Second, it was demonstrated that EP has an important role to play in the social environment (Study 4), and finally, EP has been shown to influence actual moment-by-moment regulation of behaviour in the focus of attention (studies 5-8). Research on the effects of EP is in its infancy, and yet it has already proved to have an important contribution to three major theoretical areas. The scope for further investigation of these effects and the possible influences of this important construct are considered below.

3. Can emotional perception be measured effectively?

Although defining the broad nature of EP is straightforward, measuring it has proved problematic. Attention was drawn to these measurement difficulties in

Chapter 2, particularly the lack of accurate self-report measures to assess EP and the weak internal consistency coefficients associated with objective measures.

Despite these difficulties, in addition to objective measures, the Affective Perception Test (APT) does seem to measure EP effectively. Study 1 demonstrated that the scale was reliable and valid, and further supporting evidence was found in studies 2 and 3. Not only did the scale demonstrate good reliability, construct and discriminant validity, it also proved to be useful in predicting academic achievement.

4. Is emotional perception independent from personality and cognitive ability?

In order to determine whether EI components are independent abilities, it needs to be demonstrated that they have some independent status over and above personality and cognitive ability. Aspects of these potential confounds most likely to be associated with EI components were described in Chapter 3.

Studies 2 and 3 provided evidence for the independent status of EP over personality and cognitive ability. Of all the other EI components, EP demonstrated the lowest correlations with both personality dimensions and cognitive ability. These results support the contention that EP represents a semi-independent ability within the EI construct.

5. Is emotional perception related to theoretically relevant variables including other emotional intelligence components?

Researchers have classified EI as a type of ability within the traditional intelligence framework (e.g., Mayer et al., 1999). One of the criteria for an ability is that there should be positive correlations between measures (e.g., Davies et al., 1998). This criterion was supported by data from studies 2 and 3 where EP correlated positively with the EI scales of emotional clarity, emotional awareness and emotional expression. Although in line with previous research which has conceptualised EI as being a set of related abilities (e.g., Davies et al., 1998; Martinez-Pons, 1997; Mayer & Geher, 1996; Salovey & Mayer, 1990), the correlations were small to moderate demonstrating that EP still retained independent status over other EI variables. Similarly, EP showed small to moderate correlations with theoretically relevant variables of well-being and coping, but again retained some independent status.

6. Does emotional perception evidence predictive validity?

Predictive validity is an important aspect of intelligence which has been ignored by many of the current conceptualisations of EI. Additionally, if a measure demonstrates predictive validity it is of some practical use.

Studies 2 and 3 described evidence for the predictive validity of EP when assessing academic achievement. APT scores predicted seminar presentation grades and nursing grades more strongly than other EI components, personality, verbal IQ, well-being and coping variables. EP seems to be more closely related to performance related assessment where skills such as closely monitoring other people's reactions in order to make a good seminar presentation are fundamental. This was supported by the results of Study 4, where EP influenced practical performance, this time during class presentations. More traditional methods of assessment such as essay writing and examinations require a different set of skills. As discussed in Chapter 5, EP influences practical aspects of performance, rather than intellectual capacity assessed by traditional methods.

7. Does emotional perception have behavioural effects?

It has been suggested (Petrides & Furnham, 2000), that the status of the EI construct should be explored using experimental methodologies rather than relying purely on self-report data. Using only questionnaire-based methods makes it impossible to address the issue of whether EP influences actual behaviour. One important aspect of the thesis, therefore, was to employ more objective methods, in addition to questionnaire measures. Such methods were quasi-experimental (Study 4), employed to consider the effects of EP in a social setting, and experimental methodologies employed in the series of attentional bias studies.

EP demonstrated behavioural effects in the social environment where it predicted presenters' self-ratings of embarrassment. These results showed that EP plays an important role in interpersonal perception. Theoretical and practical implications were discussed in Chapter 6.

EP also had an important role to play in the moment-by-moment regulation of behaviour, as demonstrated by the series of four attentional bias studies reported in Chapters 8 and 9. These studies lead to the proposal and subsequent support for an account predicting the effects of EP in the focus of attention to emotionally meaningful stimuli.

8. What else needs to be done?

In reference to part one of the thesis, which considered the influence of EP on performance and whether it had longitudinal effects, first, and perhaps the most important work which needs to be conducted, is the assessment of the EI-performance relationship. As discussed in Chapter 5, this relationship can only be explored thoroughly when researchers specify clearly how they are defining performance and

which aspects of EI they are measuring. Second, as noted in Chapter 5, the longitudinal studies did not consider change over time in detail, which would have detracted from the main focus of the thesis. Future research, however, should consider this issue and perhaps introduce training initiatives between testing phases. Third, the relationship between EP and other theoretical constructs (such as self-actualisation, introduced in Chapter 1) should be considered. Given the broad range of variables which are potentially related to EP, measures chosen for the test battery employed in studies 2 and 3, were thought to be important in terms of establishing validity evidence for the APT, and determining whether EP represented an independent construct within EI. When investigating the relationship between EP and theoretically related constructs, the problems with the reliability of the coping measure, discussed in Chapter 4, indicate that not only do we need to identify the key variables which EP may be related to, but carefully select reliable and valid measures.

In terms of part two of the thesis, which considered the role of EP in the social environment, there are many other situations other than during group presentations (Study 4) in which EP may influence social interactions. One area worth considering is the influence of EP in interpersonal relationships, with both couples and family members. Indeed, there is some evidence (see Chapter 1) that EI factors, including perception, are involved in the maintenance of happy long-term relationships. It would also be interesting to further investigate the suggestion (raised in Chapter 6), that EP may account for the discrepancy between people's own perceptions and others' perceptions of them. For various reasons (discussed in Chapter 6), the data presented in Study 4 could only speculate on this issue, but EP may hold the answer to the debate over this discrepancy. It makes sense that individuals with high EP will have a smaller discrepancy between perceptions of themselves and other people's perceptions of them, as they are better equipped to assess emotional signals. Future research will concentrate on resolving the problems with the data in Study 4, and collect further data in order to investigate this suggestion.

In reference to part three of the thesis, which looked at the effects of EP on the moment-by-moment regulation of behaviour, there are a number of ways in which to continue the investigation of EP using the attentional bias framework (employed in studies 5-8), and other cognitive areas, such as memory and language. Although the application of EP to other cognitive areas is of importance, this discussion is limited to the attentional bias framework where there is still a great deal of work to be done. First, although the series of studies have demonstrated that EP influences attentional processes at stimulus durations of 500 msec, they did not consider what subsequently occurs. According to the anxiety literature, there are three main possibilities (discussed in Chapter 7). According to the vigilance-avoidance hypothesis,

individuals with high anxiety show an initial threat bias, then divert attention away in order to reduce discomfort. In a similar fashion, albeit for a different reason, individuals with low EP may show an initial bias for emotional stimuli, then divert attention away because they are less interested in the material. In contrast, individuals with high EP take longer to respond to emotional stimuli, but may actually be fixated on the material as they find it more interesting. Also, they may take longer to disengage from such material. Future research will investigate these hypotheses using more appropriate methodologies such as monitoring eye-gaze and the cue-validity paradigm (described in Chapter 7).

Second, the mediating effects of EP on attentional processes may not be exclusive to faces. Future research will attempt to replicate these findings using different types of emotional stimuli, such as the body postures used in Study 1 (see Appendix B.1).

Third, although these suggestions are logical steps forward and are important, an alternative interpretation of the four studies leads to a different line of research. In most studies, individuals with low EP are quicker to respond to emotional material than individuals with high EP. The explanation offered was that low EP individuals are less interested in affective material so respond more quickly. In contrast, individuals with high EP maintain attention on emotional material which is of significance to them (discussed in Chapter 8). This explanation lead to a suggestion, raised in Chapter 9, that what has been termed EP may incorporate an element of emotional sensitivity. Although speculative at this stage, presumably, individuals with high levels of emotional sensitivity will be more interested in emotional stimuli, thus taking longer to respond to them. In contrast, individuals with low levels of sensitivity will not be so interested in emotional stimuli and will respond quickly without lingering on the material. Adopting this approach, anxiety can be classified as a special case of emotional sensitivity where too much interest in emotional material (specifically threat) becomes a problem leading to an accentuation of the normal threat bias. Future research will further investigate the association between EP and emotional sensitivity.

Conclusion

The important construct of EP has emerged as being a core element within the EI framework. Indeed, perhaps the only independent component which is truly *emotional* in that it is not simply an aspect of personality or cognitive ability. The regulation, use and modification of emotions in oneself and others naturally depends in the first instance on the individual's ability to actually perceive these emotions.

This thesis has demonstrated that EP has an important role to play in academic performance, social interaction and the focus of attention. The investigation of EP is in its early stages, but the first issue to be resolved is whether we should incorporate emotional sensitivity into the EP construct.

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Appendix A

Statistical Appendices

This appendix contains scree plots from studies 1, 2 and 3, the results of the t-tests from studies 2 and 3, descriptive statistics from Study 4, and full analysis of variance (ANOVA) tables for the four experimental studies (5-8) in the thesis. For Study 5 independent groups ANOVA's were performed on the data. For studies 6, 7 and 8, mixed design ANOVA's were performed on the data.

For independent groups ANOVA's, levene's test was employed to assess equality of variances. When the test was significant, equal variances were not assumed. When the test was non-significant, equal variances were assumed. For the mixed ANOVA's, mauchley's test of sphericity was used. When significant, the lower bound epsilon adjustment was used, when non-significant sphericity was assumed. At the start of each ANOVA table, it is reported whether levene's test or mauchleys were significant.

Conventions

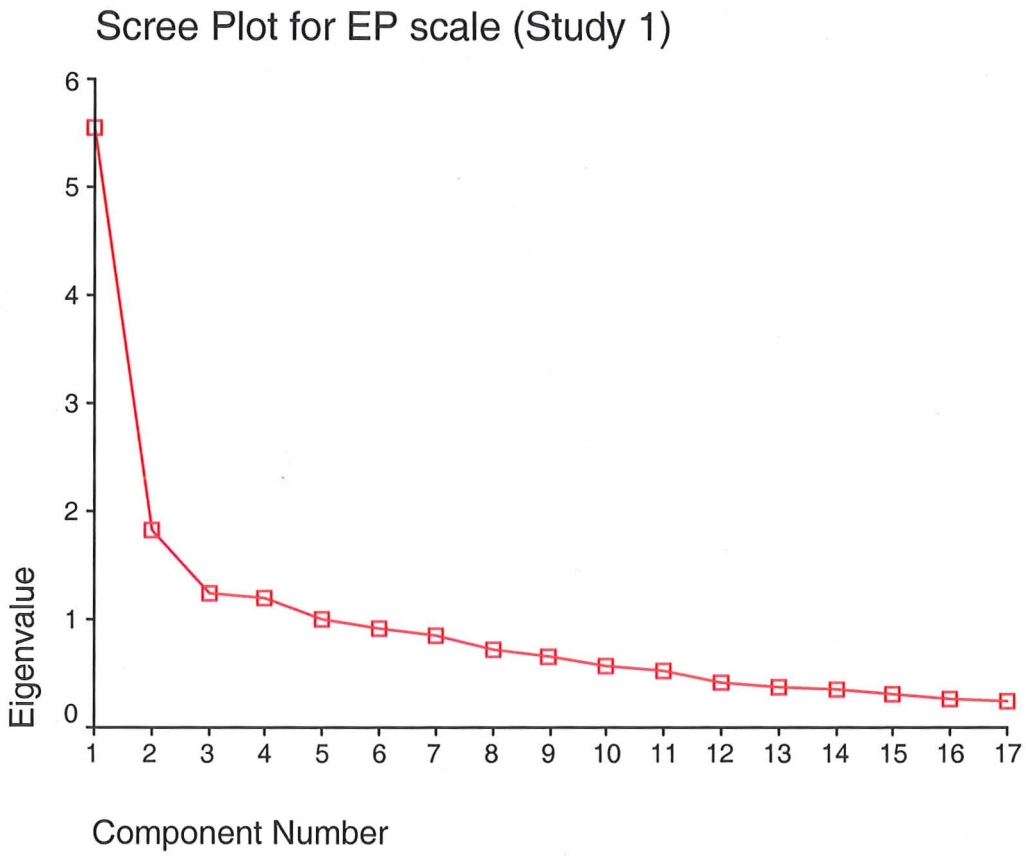
All the statistical tables which follow were produced using the SPSS analysis package. For studies 2 and 3, in order, the columns of each table refer to the name of the factor, the Mean, the t value, the degrees of freedom of the factor (df), and the Probability level (Sig). For studies 5, 6, 7 and 8, in order, the columns of each table refer to the name of the factor (Source), sums of Squares (Sum of squares), the degrees of freedom of the factor (df), the Mean Square Error (Mean Square), the F value, and the Probability level.

A number of conventions have been adopted in naming the factors. Sheer space on the page does not allow all labels to be expanded upon. These are described below;

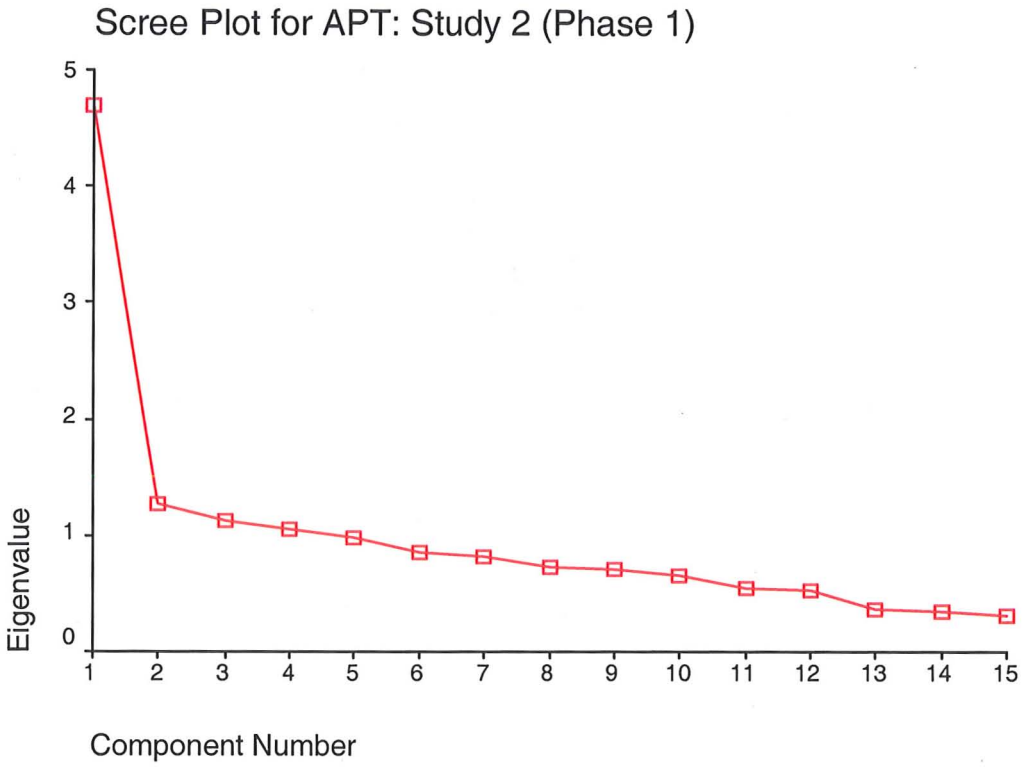
TA	Trait anxiety (for studies 5, 6, 7 and 8)
DEP	Depression (Study 8)
Same	Refers to the type of crowd (all angry, all happy/sad, all neutral) for studies 6 and 8. Note that happy faces are substituted for sad faces in Study 8.
Diff	Refers to the type of target (angry in neutral crowd, happy/sad in neutral crowd or neutral in angry/happy/sad crowd) for studies 6 and 8.
Ang	Refers to the number of angry faces (1 angry, 2 angry, 3 angry) within a neutral background for Study 7.
Hap	Refers to the number of happy faces (1 happy, 2 happy, 3 happy) within a neutral background for Study 7.

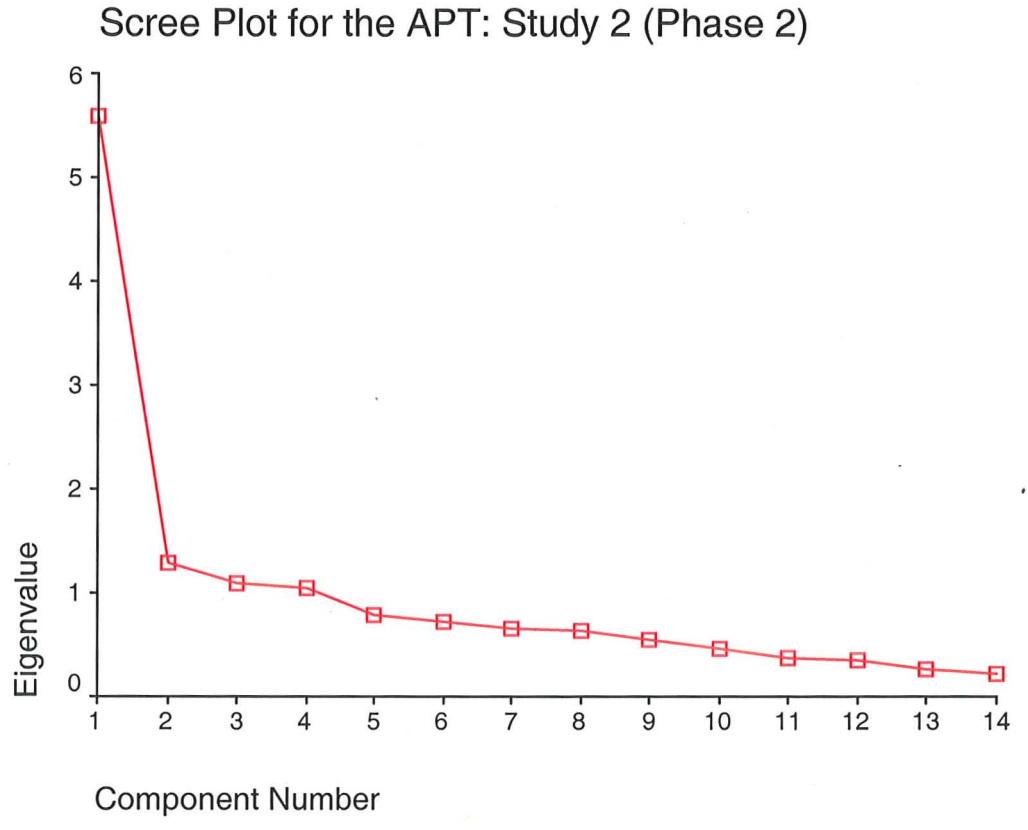
First the appendix for Study 1 is presented which is identified as A.1. Second, the appendix for the longitudinal studies is presented which is identified by A.2-3 and is split up by Chapters. During phase 1 nurses completed a 60-item personality scale, but used a reduced 30-item measure in phase 2. In order to compare across both phases, a new score was calculated for phase 1 using only the 30-items later used in phase 2. This explains the discrepancy between descriptive statistics for phase 1 of the nursing study and scores presented in the appendix. Third, the appendix for the quasi-experimental study is presented which is identified by A.4. Forth, each experimental study (5-8) has a separate appendix devoted to it. These appendices are identified as A.n where n refers to the number of the study in the main body of the thesis. Tests for equality of variance are described first, these are followed by full ANOVA tables. Where a number of different analyses were performed on a set of data the appendix is split up into sections.

Study 1

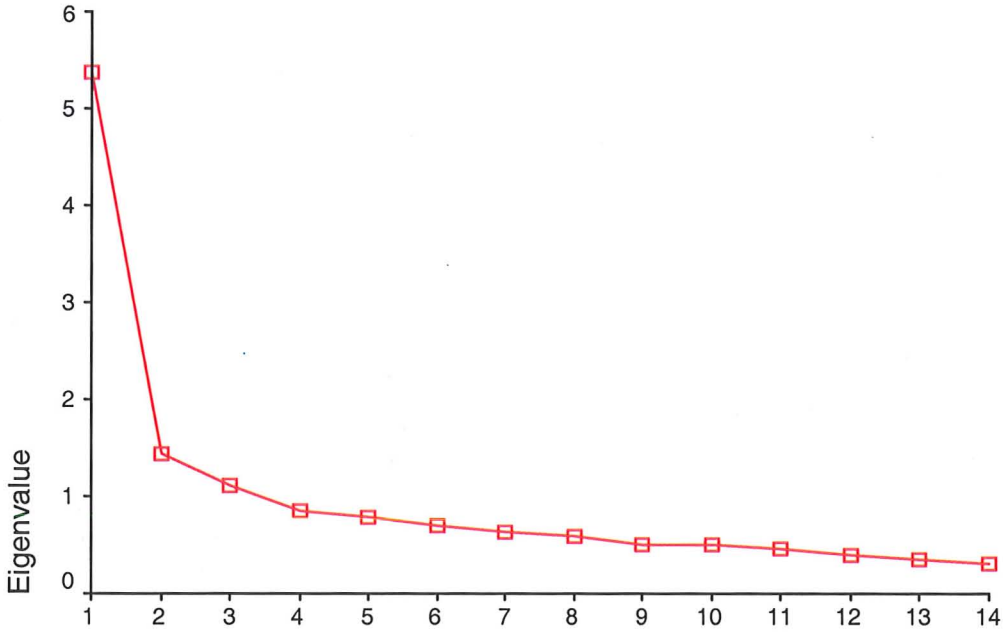

Scree Plot for EP scale (Study 1)
Eigenvalue
0
1
2
3
4
5
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Component Number

Chapter 4 (studies 2 and 3)

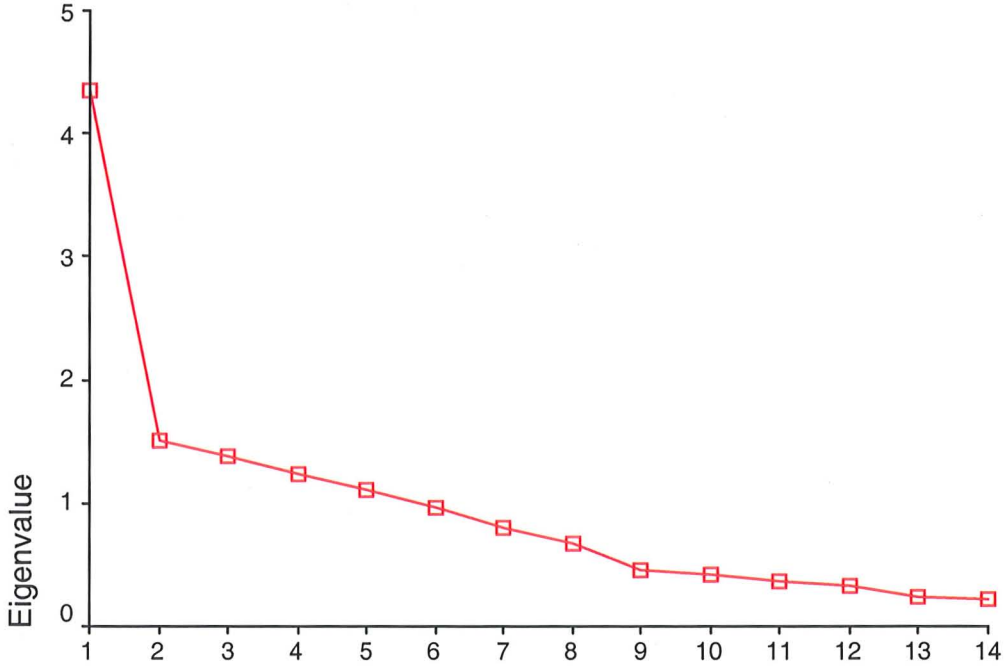




Scree Plot for APT: Study 3 (Phase 1)



Scree Plot for APT: Study 3 (Phase 2)



1. Independent samples t-tests between nurses (Study 2) and managers (Study 3) for phase 1.

Factor	Mean		t	df	sig
	nurses	managers			
Emotional intelligence					
Attention	52.831	48.448	7.506	321	.000
Clarity	41.326	37.627	6.977	321	.000
Expression	76.955	73.682	2.681	321	.008
EP	79.443	74.248	4.213	321	.000
Personality					
Neuroticism	17.295	17.648	.675	321	.500
Extraversion	21.142	22.572	3.381	321	.001
Openness	20.523	19.943	1.529	321	.128
Agreeableness	21.219	20.521	.800	321	.425
Conscientiousness	22.019	22.122	.222	321	.825
Cognitive ability					
Verbal IQ	13.657	13.524	.409	321	.683
Well-being					
A-C	4.062	3.788	2.960	321	.003
D-E	4.362	4.373	.126	321	.900
Coping					
Situation	13.516	13.000	1.630	321	.104
Accomodation	12.955	11.986	3.318	321	.001
Devaluation	12.241	11.193	2.949	321	.003
Avoidance	11.618	10.537	2.897	321	.004
Reduction	13.595	12.951	2.095	321	.037
Cope total	63.927	59.669	3.682	321	.000

2. Independent samples t-tests between nurses (Study 2) and managers (Study 3) for phase 2.

Factor	Mean		t	df	sig
	nurses	managers			
Emotional intelligence					
Attention	47.750	47.473	.289	180	.773
Clarity	37.486	36.054	2.052	180	.042
Expression	71.453	69.391	2.519	180	.009
EP	74.277	66.013	4.958	180	.000
Personality					
Neuroticism	17.250	17.648	.634	180	.527
Extraversion	21.851	20.567	2.646	180	.009
Openness	20.898	19.364	3.339	180	.001
Agreeableness	21.833	20.135	3.825	180	.000
Conscientiousness	22.805	21.243	3.232	180	.001
Cognitive ability					
Verbal IQ	14.990	13.473	4.115	180	.000
Well-being					
A-C	3.998	3.673	2.673	180	.008
D-E	4.290	4.078	1.892	180	.060
Coping					
Situation	12.750	12.905	.407	180	.684
Accomodation	12.657	12.486	.479	180	.633
Devaluation	11.675	11.473	.431	180	.667
Avoidance	10.879	11.229	.726	180	.469
Reduction	13.277	12.243	2.720	180	.007
Cope total	61.240	60.337	.611	180	.542

Chapter 5 (studies 2 and 3)

1. Repeated measures t-tests for nurses (Study 2) over phases 1 and 2.

Factor	Mean (nurses)		t	df	sig
	t1	t2			
Emotional intelligence					
Attention	52.831	47.750	7.903	107	.000
Clarity	41.326	37.486	7.686	107	.000
Expression	76.955	71.453	5.138	107	.000
EP	79.443	74.277	4.982	107	.000
Personality					
Neuroticism	17.295	17.250	.500	107	.645
Extraversion	21.142	21.851	1.491	107	.139
Openness	20.523	20.898	3.520	107	.001
Agreeableness	21.219	21.833	2.737	107	.007
Conscientiousness	22.019	22.805	3.407	107	.001
Cognitive ability					
Verbal IQ	13.657	14.990	7.023	107	.000
Well-being					
A-C	4.062	3.998	2.788	107	.006
D-E	4.362	4.290	2.448	107	.016
Coping					
Situation	13.516	12.750	4.696	107	.000
Accomodation	12.955	12.657	.665	107	.508
Devaluation	12.241	11.675	1.685	107	.095
Avoidance	11.618	10.879	1.635	107	.105
Reduction	13.595	13.277	.320	107	.749
Cope total	63.927	61.240	3.901	107	.000

2. Repeated measures t-tests for managers (Study 3) over phases 1 and 2.

Factor	Mean (managers)		t	df	sig
	t1	t2			
Emotional intelligence					
Attention	48.448	47.473	2.509	73	.014
Clarity	37.627	36.054	2.545	73	.013
Expression	73.682	69.391	3.392	73	.001
EP	74.248	66.013	5.823	73	.000
Personality					
Neuroticism	17.648	17.648	.956	73	.342
Extraversion	22.572	20.567	3.416	73	.001
Openness	19.943	19.364	1.052	73	.296
Agreeableness	20.521	20.135	4.617	73	.000
Conscientiousness	22.122	21.243	2.321	73	.023
Cognitive ability					
Verbal IQ	13.524	13.473	.044	73	.965
Well-being					
A-C	3.788	3.673	.035	73	.972
D-E	4.373	4.078	1.415	73	.161
Coping					
Situation	13.000	12.905	.455	73	.650
Accomodation	11.986	12.486	1.166	73	.248
Devaluation	11.193	11.473	.036	73	.971
Avoidance	10.537	11.229	1.460	73	.149
Reduction	12.951	12.243	1.650	73	.103
Cope total	59.669	60.337	.145	73	.885

Study 4

1. Means (M) and standard deviations (SD) for all variables across the eight groups.

Group	N	EP of presenters		Expression of presenters		Empathy of presenters		Presenters embarrassment ratings of themselves		Audience embarrassment ratings of presenters	
		M	SD	M	SD	M	SD	M	SD	M	SD
1	14	70.214	10.908	73.857	12.056	158.429	15.692	9.071	4.222	7.090	1.866
2	18	71.000	9.387	73.167	12.401	153.889	16.102	9.444	4.256	7.818	1.174
3	12	72.418	12.743	70.000	13.490	157.667	15.785	8.917	4.852	5.899	1.102
4	12	72.750	10.894	73.167	12.997	158.917	19.866	9.917	3.906	7.525	2.355
5	14	70.642	9.223	75.000	10.593	155.429	16.543	10.214	3.945	8.425	2.101
6	13	70.307	10.290	74.769	13.717	155.000	15.656	10.539	4.854	8.009	3.129
7	10	72.200	9.452	73.600	10.648	157.300	19.987	9.700	4.498	7.992	1.196
8	16	74.125	10.085	73.125	14.000	157.375	14.216	.375	4.649	8.876	2.175

Study 5

1. Independent groups ANOVA for angry bias.

Levenes test was non-significant [F(3,49) = 0.187, n.s.] so equal variances were assummed.

Source	Sum of squares	df	Mean Square	F	Sig.
EP	1172.275	1	1172.275	.338	.564
TA	2597.469	1	2597.469	.749	.391
EP*TA	16252.803	1	16252.803	4.689	.035
Error	169853.088	49	3466.390		

2. Independent groups ANOVA for happy bias.

Levenes test was non-significant [F(3,49) = 0.720, n.s.] so equal variances were assummed.

Source	Sum of squares	df	Mean Square	F	Sig.
EP	27.155	1	27.155	.006	.939
TA	21980.614	1	21980.614	4.821	.033
EP*TA	1550.613	1	1550.613	.340	.560
Error	223392.920	49	4559.039		

Study 6

1. 2x2x3 mixed ANOVA for the same displays.

Mauchly's test of sphericity was significant [W(2) = 0.519, p<0.05] so the lower bound epsilon was employed.

Within-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
Same	1673309.878	1	1673309.878	25.023	.000
Same*EP	57580.768	1	57580.768	.861	.358
Same*TA	90327.840	1	90327.840	1.351	.251
Same*EP*TA	17434.061	1	17434.061	.261	.612
Error	3076003.086	46	66869.632		

Between-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
EP	95085.210	1	95085.210	.265	.609
TA	335632.080	1	335632.080	.936	.338
Error	16500208.450	46	358700.184		

2. 2x2x2 mixed ANOVA for the different display – Angry in neutral/Happy in neutral.

Mauchly's test of sphericity was non-significant [W(2) = 1.000, n.s.] so sphericity was assummed.

Within-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
Diff	547927.276	1	547927.276	45.295	.000
Diff*EP	123300.606	1	123300.606	23.110	.000
Diff*TA	279557.886	1	279557.886	10.193	.003
Diff*EP*TA	3560.913	1	3560.913	.294	.590
Error	556453.804	46	12096.822		

Between-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
EP	90450.955	1	90450.955	.805	.374
TA	18853.912	1	18853.912	.168	.684
Error	5169727.490	46	112385.380		

3. 2x2x2 mixed ANOVA for the different display – Neutral in angry/Neutral in happy.

Mauchly's test of sphericity was non-significant [W(2) = 0.89, n.s.] so sphericity was assumed.

Within-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
Diff	45814.802	1	45814.802	2.084	.156
Diff*EP	3.105	1	3.105	.000	.999
Diff*TA	115.138	1	115.138	.005	.943
Diff*EP*TA	5164.743	1	5164.743	.235	.630
Error	1011431.717	46	21987.646		

Between-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
EP	37788.055	1	37788.055	.276	.602
TA	2401.307	1	2401.307	.018	.895
Error	6308592.079	46	137143.306		

Study 7

1. 2x2x3 mixed ANOVA for the angry displays.

Mauchly's test of sphericity was non-significant [W(2) = 0.914, n.s.] so sphericity was assumed.

Within-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
Ang	2302644.390	2	1151322.200	23.112	.000
Ang*EP	164874.017	2	82437.008	1.655	.196
Ang*TA	311562.156	2	155781.078	3.127	.048
Ang*EP*TA	706579.949	2	353289.975	7.092	.001
Error	4881914.560	98	49815.455		

Between-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
EP	1114541.840	1	1114541.840	2.100	.154
TA	193939.343	1	193939.343	.365	.548
Error	26003327.310	49	530680.149		

2. 2x2x3 mixed ANOVA for the happy displays.

Mauchly's test of sphericity was non-significant [W(2) = 0.940, n.s.] so sphericity was assumed.

Within-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
Hap	5124065.650	2	2562032.820	50.80	.000
Hap *EP	31187.547	2	15593.773	.309	.735
Hap *TA	82253.340	2	41126.670	.815	.445
Hap *EP*TA	290172.055	2	145086.028	2.877	.061
Error	4942455.140	98	50433.216		

Between-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
EP	589815.519	1	589815.519	1.868	.178
TA	12022.674	1	12022.674	.038	.846
Error	15470177.010	49	315717.899		

Study 8

1. 2x2x2x3 mixed ANOVA for the same displays.

Mauchly's test of sphericity was non-significant [W(2) = 1.000, n.s.] so sphericity was assumed.

Within-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
Same	2546896.808	2	1273448.404	19.078	.000
Same*EP	27092.865	2	13546.433	.203	.717
Same*TA	69419.839	2	34709.919	.520	.596
Same*DEP	57936.301	2	28968.151	.434	.649
Same*EP*TA	78593.776	2	39296.888	.589	.557
Same*EP*DEP	40445.004	2	20222.502	.030	.802
Same*TA*DEP	29481.043	2	14740.521	.221	.739
Same*EP*TA*DEP	172017.336	2	86008.668	1.289	.281
Error	5606926.553	84	66749.126		

Between-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
EP	108213.537	1	108213.537	.572	.454
TA	4161.893	1	4161.893	.022	.889
DEP	589865.353	1	589865.353	3.118	.081
Error	7945432.747	42	189176.970		

2. 2x2x2x2 mixed ANOVA for the different display – Angry in neutral/Sad in neutral.

Mauchly's test of sphericity was non-significant [W(2) = 1.000, n.s.] so sphericity was assummed.

Within-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
Diff	291145.654	1	291145.654	12.607	.001
Diff *EP	129720.772	1	129720.772	5.617	.022
Diff *TA	142602.608	1	142602.608	6.175	.017
Diff *DEP	72868.858	1	72868.858	3.155	.123
Diff *EP*TA	37745.174	1	37745.174	1.634	.208
Diff *EP*DEP	34195.521	1	34195.521	1.481	.230
Diff *TA*DEP	22369.409	1	22369.409	.969	.331
Diff *EP*TA*DEP	29988.086	1	29988.086	1.299	.261
Error	969921.053	42	23093.358		

Between-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
EP	121892.138	1	121892.138	3.841	.057
TA	105077.259	1	105077.259	3.311	.078
DEP	94140.932	1	94140.932	2.967	.092
Error	1332849.901	42	31734.521		

3. 2x2x2x2 mixed ANOVA for the different display – Neutral in angry/Neutral in sad
Mauchly's test of sphericity was non-significant [W(2) = 0.98, n.s.] so sphericity was assummed

Within-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
Diff	6018.086	1	6018.086	.197	.660
Diff *EP	680.514	1	680.514	.022	.882
Diff *TA	2391.070	1	2391.070	.078	.781
Diff *DEP	2352.264	1	2352.264	.077	.783
Diff *EP*TA	1405.339	1	1405.339	.046	.831
Diff *EP*DEP	43640.231	1	43640.231	1.427	.234
Diff *TA*DEP	12646.182	1	12646.182	.414	.524
Diff *EP*TA*DEP	35237.646	1	35237.646	1.152	.289
Error	1284166.781	42	30575.400		

Between-Subjects effects

Source	Sum of squares	df	Mean Square	F	Sig.
EP	93653.467	1	93653.467	2.834	.102
TA	77628.578	1	77628.578	2.349	.133
DEP	119278.552	1	119278.552	3.610	.064
Error	1387871.196	42	33044.552		

Appendix B

Materials Appendices

The following appendices contain the materials for all the empirical work conducted throughout the thesis. Each empirical study (or set of studies) has its own appendix which is numbered accordingly, for example an appendix for Study 1 would be numbered B.1 and so on. Where necessary, each appendix is split into sections. The same materials were used in studies 2 and 3 so the materials appear in the same appendix (B.2-3). This is also the case for studies 5, 6, 7 and 8 where many of the same materials were used. The materials for these four studies appear in the same appendix (B.5-8), which is split into self-report measures and materials for the attentional tasks.

Study 1

The 17-item Affective Perception Test (APT)

This questionnaire concerns the degree to which you feel you are able to spot the emotions other people are feeling. Please read each question carefully and circle **only one number** on the scale.

1. I can tell when other people are affected by emotionally charged music
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

2. I can see when a friend is angry with me just by looking at them
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

3. I recognise enthusiastic laughter in other people, regardless of whether I respond to it or not
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

4. I am good at recognising emotions when they are expressed over the telephone
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

5. I know which of my friends are more or less likely than me to initiate physical contact during conversations
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

6. I am very aware of when other people are feeling nervous or embarrassed in public
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

7. I can tell a lot about what a person is experiencing by looking at their facial expression
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

8. I know which of my friends would make good actors or actresses
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

9. I am able to tell whether someone is anxious or not just by observing their body language
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

10. I can recognise people who are shy amongst strangers
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

11. I know when someone is trying to seduce me
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

12. I find it easy to recognise what feelings people are portraying in games like charades
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

13. In any social situation, I know who wants to be the centre of attention
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

14. Just by listening to someone's voice on a radio talk show, I can tell whether they are angry or not
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

15. I recognise immediately when someone wants to express intimacy to a greater or lesser degree than I am comfortable with
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

16. When someone smiles at me, I can tell whether it is false or if it is really meant
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

17. I find it difficult to tell how someone is feeling just by looking at them
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

The 13-item Affective Communication Test (ACT)

This questionnaire concerns the degree to which you feel you are able to express emotions. Please read each question carefully and circle **only one number** on the scale.

1. When I hear good dance music, I can hardly keep still
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

2. My laugh is soft and subdued
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

3. I can easily express emotion over the telephone
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

4. I often touch friends during conversations
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

5. I dislike being watched by a large group of people
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

6. I usually have a neutral facial expression
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

7. People tell me that I would make a good actor or actress
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

8. I like to remain unnoticed in a crowd
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

9. I am shy among strangers
   strongly disagree 1 2 3 4 5 6 7 **strongly agree**

10. I am able to give a seductive glance if I want to
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

11. I am terrible at pantomime as in games like charades
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

12. At small parties I am the centre of attention
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

13. I show that I like someone by hugging or touching that person
    strongly disagree 1 2 3 4 5 6 7 **strongly agree**

The Facial and Posture Perception Test

Consists of two similar sub-tests:

Can you tell what a person is viewing from their face?

This booklet contains pictures of people adopting various facial expressions. In each case you are asked to choose which word from a list of six emotions best describes how this person would be feeling. There are twelve pictures in all, and the booklet will take only a few minutes to complete.

The emotions are anger, fear, happiness, sadness, surprise and disgust.

Do not spend too long thinking about each picture. Select **one emotion** for each picture. If you are not sure, pick the emotion which is closest in your opinion.

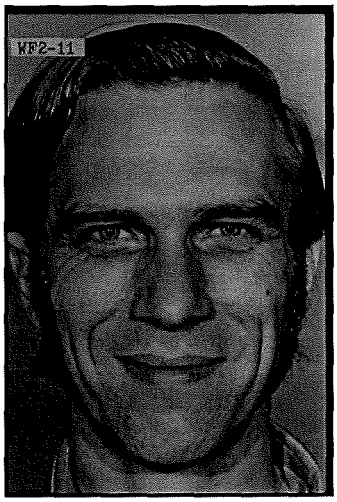
Each face was rated using the following scale;

Anger
Disgust
Fear
Happiness
Sadness
Surprise

References to exact images were as follows: happiness (NR1-6 & WF2-11), sadness (EM4-24 & MO1-30), anger (WF3-1 & C2-12), surprise (NR1-14 & GS1-16), fear (PF2-30 & JJ5-13), and disgust (JB1-16 & C1-4).

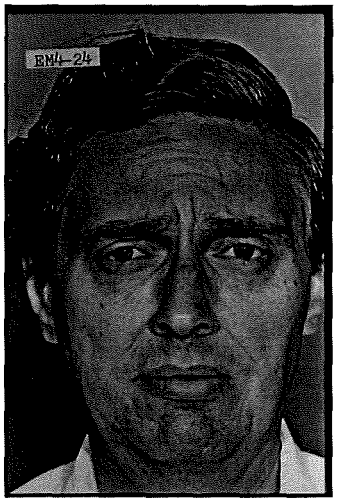
Happiness

Happiness

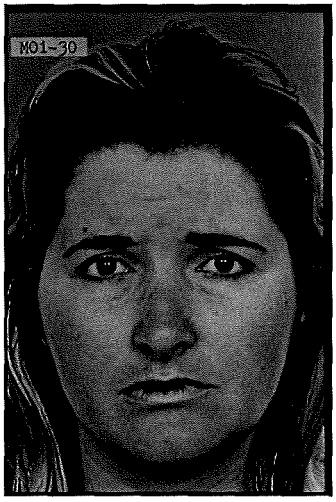


B.1

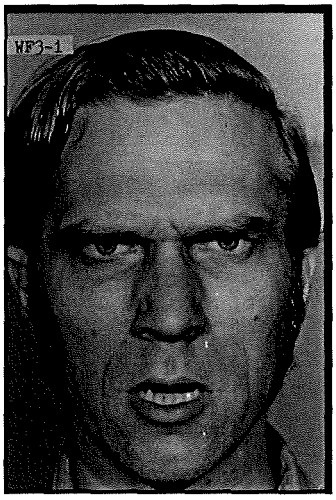
Sadness



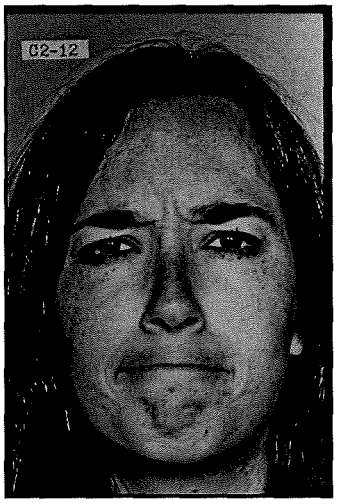
Sadness



Anger

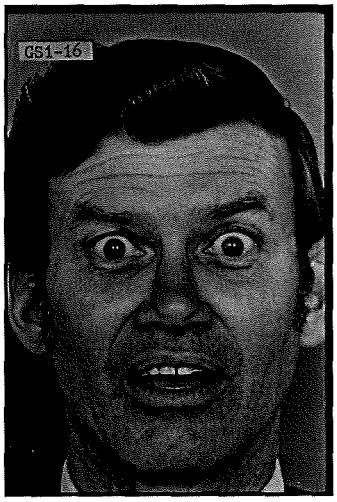


Anger



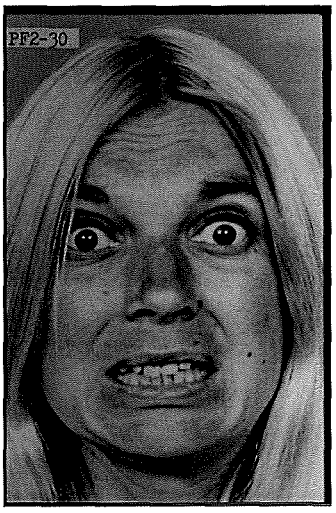
Surprise

Surprise

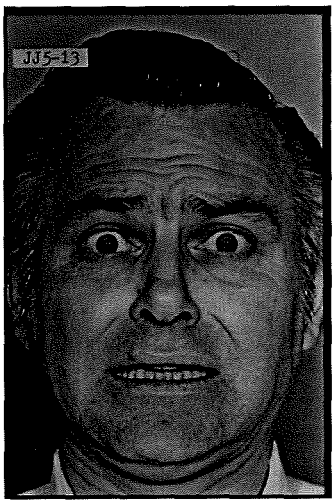


B.1

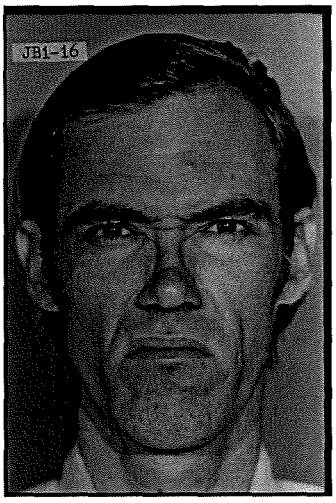
Fear



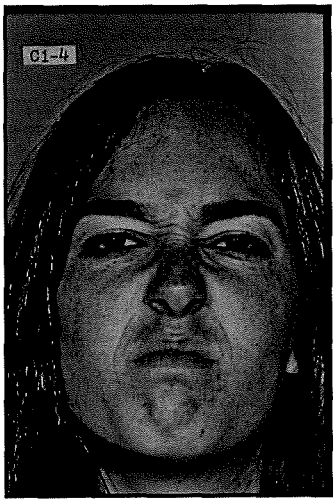
Fear



Disgust



Disgust



Can you tell what a person is feeling from the way they are standing?

This booklet contains illustrations of a mannekin in various poses seen from the front and the side. In each case you are asked to choose which word from a list of five emotions best describes how this person adopting this posture would be feeling. There are ten illustrations in all, and the booklet will take no longer than a couple of minutes to complete.

The emotions are anger, fear, happiness, sadness and surprise. Please note that unlike the previous section, the emotion disgust is not an option.

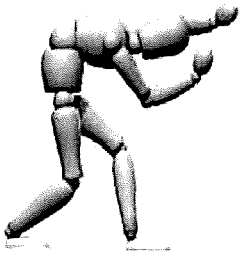
Do not spend too long thinking about each pose, your first impressions are important. Select **one and only one emotion** for each posture. If you are not sure, pick the emotion which is closest in your opinion.

Each posture was rated using the following scale;

Anger
Fear
Happiness
Sadness
Surprise

The five postures displayed below were shown once each from the side and once each from the front. In order to save space in the appendix, the postures here are only shown from the side.

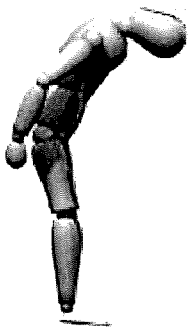
Angry



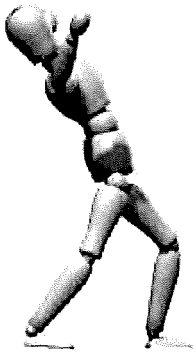
Fear

B.1

Happy



Sad



Surprise

Studies 2-3

Questionnaire pack for nurses (Study 2) and managers (Study 3) phase 1

It is noted that nurses used the original 60-item NEO-FFI personality inventory in phase 1 and were given the actual booklets to complete. Presented here is the shortened 30-item version used in phase 2 for nurses and both phases for managers. For the purposes of clarity in the appendix, the names of the measures appear at the top of each questionnaire. These names were not present when administering the questionnaire packs.

Questionnaire Pack

This questionnaire pack contains a total of eight different questionnaires concerning aspects of the way you think, feel and act.

All of the questionnaires are quite short, so shouldn't take too long to complete. A brief description of each questionnaire and specific instructions for completing it are given at the start of each one.

If you have any difficulties whilst completing the questionnaire pack, raise your hand and ask a question.

All the information collected will be kept confidential and anonymous, and you will not be identifiable except through the use of a key which only the experimenter will have access to. This cover sheet will be discarded before any data are entered into a computer.

You will also receive feedback on these questionnaires which I hope you will find interesting. This will be made available in your student tray.

Please complete the following information before working your way through the questionnaire packs:

Student number:-	.....
Name:-	.....
Date of birth:-	**.....day .....month ..... year**
Gender:-	☐ **Male** ☐ **Female**

Informed consent

I fully understand the nature of this study, and appreciate that I can withdraw my participation at any time. I give permission for the data I have provided to be cross-referenced with my academic records for the purposes of this research only. I understand that complete confidentiality will be observed at all times, and I will not be identifiable from any records held on a computer or otherwise. Signature:

Questionnaire 1 (Emotional Awareness)

This questionnaire is concerned with the degree to which you think about and are aware of your emotions. Please read the following items carefully and then **circle around a number for each item on the table** to show your answer. Please reply to all the items.

Items	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. People would be better off if they felt less and thought more	1	2	3	4	5
2. I don't think it's worth paying attention to your emotions or moods	1	2	3	4	5
3. I don't usually care much about what I'm feeling	1	2	3	4	5
4. Feelings give direction to life	1	2	3	4	5
5. I believe in acting from the heart	1	2	3	4	5
6. The best way for me to handle my feelings is to experience them to the fullest	1	2	3	4	5
7. One should never be guided by emotions	1	2	3	4	5
8. I never give in to my emotions	1	2	3	4	5
9. I pay a lot of attention to how I feel	1	2	3	4	5
10. I don't pay much attention to my feelings	1	2	3	4	5
11. I often think about my feelings	1	2	3	4	5
12. Feelings are a weakness humans have	1	2	3	4	5
13. It is usually a waste of time to think about your emotions	1	2	3	4	5

Questionnaire 2 (Emotional Clarity)

This questionnaire is concerned with the degree to which you understand and identify your emotions. Please read the following items carefully and then **circle around a number for each item on the table** to show your answer. Please reply to all the items.

Items	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. Sometimes I can't tell what my feelings are	1	2	3	4	5
2. I am rarely confused about how I feel	1	2	3	4	5
3. I can never tell how I feel	1	2	3	4	5
4. My belief and opinions always seem to change depending on how I feel	1	2	3	4	5
5. I am often aware of my feelings on a matter	1	2	3	4	5
6. I am usually confused about how I feel	1	2	3	4	5
7. I feel at ease about my emotions	1	2	3	4	5
8. I can't make sense out of my feelings	1	2	3	4	5
9. I am usually very clear about my feelings	1	2	3	4	5
10. I usually know my feelings about a matter	1	2	3	4	5
11. I almost always know exactly how I am feeling	1	2	3	4	5

Questionnaire 3 (Emotional Expression)

This questionnaire is concerned with the degree to which you feel you are able to express various different emotions. Please read each question carefully and then **circle around a number for each item on the table** to show your answer. Note that unlike the first two sections, this questionnaire uses a 7-point scale. Please reply to all the items.

Items	Strongly Disagree						Strongly Agree
1. I often tell people I love them	1	2	3	4	5	6	7
2. I show that I like someone by hugging or touching that person	1	2	3	4	5	6	7
3. I often touch friends during conversations	1	2	3	4	5	6	7
4. Watching television or reading a book can make me laugh out loud	1	2	3	4	5	6	7
5. I laugh a lot	1	2	3	4	5	6	7
6. When I am angry people around me usually know	1	2	3	4	5	6	7
7. People can tell from my facial expressions how I am feeling	1	2	3	4	5	6	7
8. Whenever people do nice things for me, I feel "put on the spot" and have trouble expressing my gratitude	1	2	3	4	5	6	7
9. When I really like someone they know it	1	2	3	4	5	6	7
10. I often laugh so hard that my eyes water or my sides ache	1	2	3	4	5	6	7
11. When I am alone, I can make myself laugh by remembering something from the past	1	2	3	4	5	6	7
12. My laugh is soft and subdued	1	2	3	4	5	6	7
13. If a friend is surprising me with a gift, I wouldn't know how to react	1	2	3	4	5	6	7
14. I apologise when I have done something wrong	1	2	3	4	5	6	7
15. If someone makes me angry in a public place, I will "cause a scene"	1	2	3	4	5	6	7
16. I always express disappointment when things don't go as I'd like them to	1	2	3	4	5	6	7

Questionnaire 4 (EP)

This questionnaire concerns the degree to which you feel you are able to spot the emotions other people are feeling. Please read each question carefully and then **circle around a number for each item on the table** to show your answer. Note that this questionnaire also uses a 7-point scale. Please reply to all the items.

Items	Strongly Disagree						Strongly Agree
1. I can see when a friend is angry with me just by looking at them	1	2	3	4	5	6	7
2. I recognise enthusiastic laughter in other people, regardless of whether I respond to it or not	1	2	3	4	5	6	7
3. I am good at recognising emotions when they are expressed over the telephone	1	2	3	4	5	6	7
4. I know which of my friends are more or less likely than me to initiate physical contact during conversations	1	2	3	4	5	6	7
5. I am very aware of when other people are feeling nervous or embarrassed in public	1	2	3	4	5	6	7
6. I can tell a lot about what a person is experiencing by looking at their facial expression	1	2	3	4	5	6	7
7. I know which of my friends would make good actors or actresses	1	2	3	4	5	6	7
8. I am able to tell whether someone is anxious or not just by observing their body language	1	2	3	4	5	6	7
9. I can recognise people who are shy amongst strangers	1	2	3	4	5	6	7
10. I know when someone is trying to seduce me	1	2	3	4	5	6	7
11. In any social situation, I know who wants to be the centre of attention	1	2	3	4	5	6	7
12. Just by listening to someone's voice on a radio talk show, I can tell whether they are angry or not	1	2	3	4	5	6	7
13. I recognise immediately when someone wants to express intimacy to a greater or lesser degree than I am comfortable with	1	2	3	4	5	6	7
14. When someone smiles at me, I can tell whether it is false or if it is really meant	1	2	3	4	5	6	7

Questionnaire 5 (Verbal IQ)

This test assesses your knowledge of the meaning of words. Please read the following items carefully and then **circle around a word for each item on the table** to show your answer. Please reply to all the items.

Items	Response Choices
1. Easy means the opposite of....	problem simple difficult always cannot
2. Seed is to plant as egg is to....	tree bird pollen oats potato
3. Right means the opposite of....	action good careless wrong motive
4. Old means the same as....	decaying tired aged youth mended
5. Army is to navy as soldier is to....	airman sea service sailor uniform
6. Portion means the same as....	some whole part any cake
7. Up means the opposite of....	short small low down young
8. Ill means the same as....	health fever dirty mumps sick
9. Legs are to running as teeth are to....	chattering walking eating biting arms
10. Never means the opposite of....	rarely always now will forget
11. Sky is to ground as ceiling is to....	roof down floor rug high
12. Odd means the same as....	strange even one man number
13. When is to where as time is to....	how why space length relativity
14. Multiplication is the opposite of....	subtraction addition mathematics figures division
15. Prevent means the same as....	avoid cure allow deter help
16. Permanent means the opposite of....	part-time ever changing temporary stable
17. Fact is to fiction as historian is to....	history book novelist teacher story
18. Dangerous means the opposite of....	brave cowardly situation safe bravado
19. Flat means the same as....	straight level uneven oblique inclined
20. Doubt means the opposite of....	wonder certainty correct dubious indefinite

Questionnaire 6 (Personality)

This questionnaire concerns opinions you have about yourself. Please read the following items carefully and then **circle around a number for each item on the table** to show your answer. Please respond to all the items.

Items	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. Too often, when things go wrong, I get discouraged and feel like giving up	1	2	3	4	5
2. I am a cheerful, high-spirited person	1	2	3	4	5
3. I am intrigued by the patterns I find in art and nature	1	2	3	4	5
4. Some people think of me as cold and calculating	1	2	3	4	5
5. I have a clear set of goals and work towards them in an orderly fashion	1	2	3	4	5
6. Sometimes I feel completely worthless	1	2	3	4	5
7. I really enjoy talking to people	1	2	3	4	5
8. I believe letting students hear controversial speakers can only confuse and mislead them	1	2	3	4	5
9. I'm hard-headed and tough-minded in my attitudes	1	2	3	4	5
10. I am a productive person who always gets the job done	1	2	3	4	5
11. I often feel tense and jittery	1	2	3	4	5
12. I like to be where the action is	1	2	3	4	5
13. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement	1	2	3	4	5
14. I try to be courteous to everyone I meet	1	2	3	4	5
15. I never seem to be able to get organised	1	2	3	4	5

continued.....

16. I often feel helpless and want someone else to solve my problems	1	2	3	4	5
17. I am a very active person	1	2	3	4	5
18. I have a lot of intellectual curiosity	1	2	3	4	5
19. I would rather co-operate with others than compete with them	1	2	3	4	5
20. I keep my belongings clean and neat	1	2	3	4	5
21. I am seldom sad or depressed	1	2	3	4	5
22. I laugh easily	1	2	3	4	5
23. I seldom notice the moods or feelings that different environments produce	1	2	3	4	5
24. Most people I know like me	1	2	3	4	5
25. When I make a commitment, I can always be counted on to follow through	1	2	3	4	5
26. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces	1	2	3	4	5
27. I like to have a lot of people around me	1	2	3	4	5
28. I have little interest in speculating on the nature of the universe or the human condition	1	2	3	4	5
29. If necessary, I am willing to manipulate people to get what I want	1	2	3	4	5
30. I'm pretty good about pacing myself so as to get things done on time	1	2	3	4	5

Questionnaire 7 (Well-being)

Thinking of the ***past few weeks,*** how often has your life made you feel the following....?

Circle your response for each item on the table:

Items	Never	Occasionally	SOME of the time	MUCH of the time	MOST of the time	ALL of the time
1. Tense	1	2	3	4	5	6
2. Uneasy	1	2	3	4	5	6
3. Worried	1	2	3	4	5	6
4. Calm	1	2	3	4	5	6
5. Contented	1	2	3	4	5	6
6. Relaxed	1	2	3	4	5	6
7. Depressed	1	2	3	4	5	6
8. Gloomy	1	2	3	4	5	6
9. Miserable	1	2	3	4	5	6
10. Cheerful	1	2	3	4	5	6
11. Enthusiastic	1	2	3	4	5	6
12. Optimistic	1	2	3	4	5	6

Questionnaire 8 (Coping)

This questionnaire asks about the methods you may use to cope with stressful experiences. Please read the following items carefully and then **circle around a number for each item on the table** to show your answer. Please respond to all the items.

Items	Do not use at all	Use seldomly	Use sometimes	Use frequently	Use very much
1. I try to change the situation to get what I want	1	2	3	4	5
2. I make an effort to change my expectations	1	2	3	4	5
3. I try to convince myself that the problem is not very important after all	1	2	3	4	5
4. I try to turn my attention away from the problem	1	2	3	4	5
5. I try to let off steam	1	2	3	4	5
6. I focus my efforts on changing the situation	1	2	3	4	5
7. I try to convince myself that the way things are, is in fact, acceptable	1	2	3	4	5
8. I tell myself the problem is unimportant	1	2	3	4	5
9. I try to just forget the whole thing	1	2	3	4	5
10. I try to relieve my tension somehow	1	2	3	4	5
11. I work on changing the situation to get what I want	1	2	3	4	5
12. I try to adjust my expectations to meet the situation	1	2	3	4	5
13. I tell myself the problem wasn't so serious after all	1	2	3	4	5
14. I try to keep my mind off the problem	1	2	3	4	5
15. I try to just get it off my chest	1	2	3	4	5
16. I try to fix what is wrong with the situation	1	2	3	4	5
17. I try to adjust my own standards	1	2	3	4	5
18. I tell myself the problem isn't such a big deal after all	1	2	3	4	5
19. I try to avoid thinking about the problem	1	2	3	4	5
20. I just try to relax	1	2	3	4	5

Thank-You for completing this questionnaire pack. You will be contacted in the future regarding further research.

If you have any further questions regarding this research, please contact:

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Questionnaire pack for nurses and managers phase 2

As mentioned above, the nurses completed the shortened personality questionnaire in phase 2. The only further change for both samples was an equivalent version of the verbal IQ measure presented below.

Verbal IQ phase 2 equivalent

This test assesses your knowledge of the meaning of words. Please read the following items carefully and then **circle around a word for each item on the table** to show your answer. Please reply to all the items.

Items	Response Choices
1. Easy means the opposite of....	problem simple difficult always cannot
2. Seed is to plant as egg is to....	tree bird pollen oats potato
3. Rich means the same as....	poor wealthy high new lucky
4. Foot is to leg as hand is to....	body finger tall limb arm
5. Old means the same as....	decaying tired aged youth mended
6. Portion means the same as....	some whole part any cake
7. Up means the opposite of....	short small low down young
8. Seeing is to picture as hearing is to....	sight sculpture ear song deaf
9. Scarce means the same as....	unobtainable lack unique rare frightened
10. Sky is to ground as ceiling is to....	roof down floor rug high
11. When is to where as time is to....	how why space length relativity
12. Backwards means the same as....	upside-down reversed stop forwards gear
14. Autumn is to Winter as October is to....	April July Spring rain January
14. Permanent means the opposite of....	part-time ever changing temporary stable
15. Fact is to fiction as historian is to....	history book novelist teacher story
16. Industrious means the same as....	busy hard-working energetic overworked happy
17. Motive is to method as why is to....	wherefore reason how because where
18. Flat means the same as....	straight level uneven oblique inclined
19. Doubt means the opposite of....	wonder certainty correct dubious indefinite
20. The day after tomorrow is to the day before yesterday as Wednesday is to....	Friday Saturday Sunday Monday Tuesday

Study 4

Presenters self-ratings of embarrassment

Seminar Group Name:

Room no. & time of seminar:

Seminar topic:

Please complete the following scales describing how you felt when presenting to the rest of the group by circling the most appropriate response. **IT IS IMPORTANT THAT YOU DO THIS IN THE ORDER IN WHICH YOU PRESENTED.**

(Circle the most appropriate response)

Presenter 1 – Name: .....
Student no: .....

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

Presenter 2 - Name: .....
Student no: .....

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

Presenter 3 - Name: .....
Student no: .....

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

Presenter 4 - Name: .....
Student no: .....

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

Presenter 5 - Name: .....
Student no: .....

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

B.4

Audience ratings of embarrassment

Presentation topic .....

Seminar group name .....

Your Student No .....

Please complete the following scales describing how you think each presenter felt during their presentation to the rest of the group. **IT IS IMPORTANT THAT YOU DO THIS IN THE ORDER IN WHICH THE GROUP PRESENTED AND AS THE PRESENATION PROGRESSES.**

(Circle the most appropriate response)

Presenter 1 Name: _____

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

Presenter 2 Name: _____

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

Presenter 3 Name: _____

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

Presenter 4 Name: _____

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

Presenter 5 Name: _____

unembarrassed	1	2	3	4	5	6	7	embarrassed
poised	1	2	3	4	5	6	7	awkward
composed	1	2	3	4	5	6	7	flustered

EP was assessed using the 14-item APT (as in the questionnaire packs for studies 2 and 3 above)

Emotional Expression was assessed using the 16-item EEQ (as in the questionnaire packs for studies 2 and 3 above)

Empathy

This questionnaire is concerned with measuring emotional responsiveness to others. Please read each question carefully and then **circle around a number for each item on the table** to show your answer. Please reply to all the items.

Items	Strongly Disagree						Strongly Agree
1. It makes me sad to see a lonely stranger in a group	1	2	3	4	5	6	7
2. People make too much of the feelings and sensitivity of animals	1	2	3	4	5	6	7
3. I often find public displays of affection annoying	1	2	3	4	5	6	7
4. I am annoyed by unhappy people who are just sorry for themselves	1	2	3	4	5	6	7
5. I become nervous if others around me seem to be nervous	1	2	3	4	5	6	7
6. I find it silly for people to cry out of happiness	1	2	3	4	5	6	7
7. I tend to get emotionally involved with a friend's problems	1	2	3	4	5	6	7
8. Sometimes the words of a love song can move me deeply	1	2	3	4	5	6	7
9. I tend to loose control when I am bringing bad news to people	1	2	3	4	5	6	7
10. The people around me have a great influence on my moods	1	2	3	4	5	6	7
11. Most foreigners I have met seemed cool and unemotional	1	2	3	4	5	6	7
12. I would rather be a social worker than work in a job training centre	1	2	3	4	5	6	7
13. I don't get upset just because a friend is acting upset	1	2	3	4	5	6	7
14. I like to watch people open presents	1	2	3	4	5	6	7
15. Lonely people are probably unfriendly	1	2	3	4	5	6	7
16. Seeing people cry upsets me	1	2	3	4	5	6	7
17. Some songs make me happy	1	2	3	4	5	6	7
18. I really get involved with the feelings of the characters in a novel	1	2	3	4	5	6	7
19. I get very angry when I see someone being ill-treated	1	2	3	4	5	6	7
20. I am able to remain calm even though those around me worry	1	2	3	4	5	6	7
21. When a friend starts to talk about his problems, I try to steer the conversation to something else	1	2	3	4	5	6	7
22. Another's laughter is not catching for me	1	2	3	4	5	6	7
23. Sometimes at the movies I am amused by the amount of crying and sniffling around me	1	2	3	4	5	6	7
24. I am able to make decisions without being influenced by people's feelings	1	2	3	4	5	6	7
25. I cannot continue to feel OK if people around me are depressed	1	2	3	4	5	6	7

B.4

26. It is hard for me to see how some things upset people so much	1	2	3	4	5	6	7
27. I am very upset when I see an animal in pain	1	2	3	4	5	6	7
28. Becoming involved in books or movies is a little silly	1	2	3	4	5	6	7
29. It upsets me to see helpless old people	1	2	3	4	5	6	7
30. I become more irritated than sympathetic when I see someone's tears	1	2	3	4	5	6	7

Studies 5-8

Self-report measures

EP (For studies 5-8) was assessed using the 14-item APT (as in the questionnaire packs for studies 2 and 3 above)

Anxiety (For studies 5-8)
Self-evaluation questionnaire (State-Anxiety)

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate response to the right of the statement to indicate how you feel *right* now, that is, *at this moment.* There is no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

STATEMENT	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

Self-evaluation questionnaire (Trait-Anxiety)

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate response to the right of the statement to indicate how you *generally* feel. There is no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

STATEMENT	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	1	2	3	4
22. I feel nervous and restless	1	2	3	4
23. I feel satisfied with myself	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I feel like a failure	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected"	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that doesn't really matter	1	2	3	4
30. I am happy	1	2	3	4
31. I have disturbing thoughts	1	2	3	4
32. I lack self-confidence	1	2	3	4
33. I feel secure	1	2	3	4
34. I make decisions easily	1	2	3	4
35. I feel inadequate	1	2	3	4
36. I am content	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39. I am a steady person	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

Depression (Study 8)

Self-response questionnaire

This questionnaire is designed to assess how you feel about life in general. All information received in response to this questionnaire will be treated in strict confidence. Please circle one statement per line and respond to all the statements.

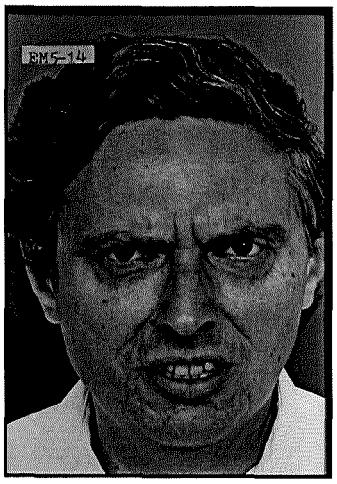
	CIRCLE YOUR CHOICE, ONE PER LINE			
1. I still enjoy the things I used to enjoy	Definitely as much	Not quite so much	Only a little	Hardly at all
2. I can laugh and see the funny side of things	As much as I always could	Not quite so much now	Definitely not so much now	Not at all
3. I feel cheerful	Not at all	Not often	Sometimes	Most of the time
4. I feel as if I am slowed down	Nearly all the time	Very often	Sometimes	Not at all
5. I have lost interest in my appearance	Definitely	I don't take so much care as I should	I may not take quite as much care	I take just as much care as ever
6. I look forward with enjoyment to things	As much as ever I did	Rather less than I used to	Definitely less than I used to	Hardly at all
7. I can enjoy a good book, radio or TV programme	Often	Sometimes	Not often	Very seldom

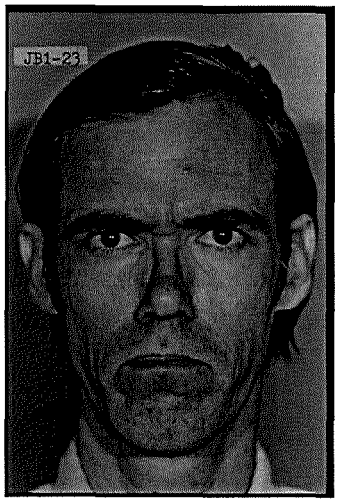
Stimuli for the attentional tasks

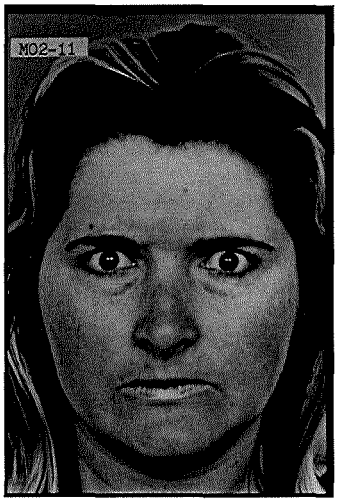
Photographs for Study 5

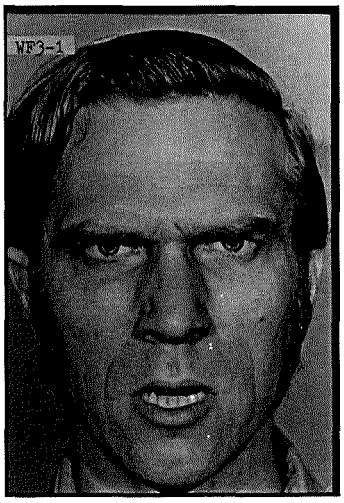
References to exact images were as follows: anger (EM5-14, JB1-23, MF2-7, MO2-11, WF3-1 & A1-14), happiness (EM4-7, JB1-9, MF1-6, MO1-4, WF2-12 & A1-6), and neutral (EM2-4, JB1-3, MF1-2, MO1-5, WF2-5 & A1-2).

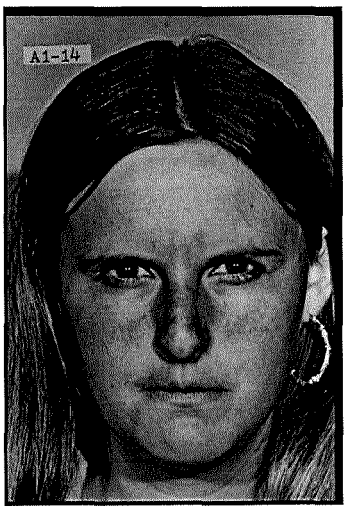
Angry face set



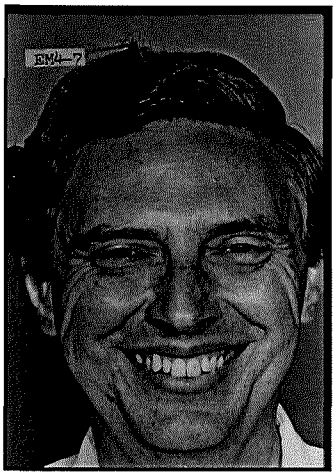


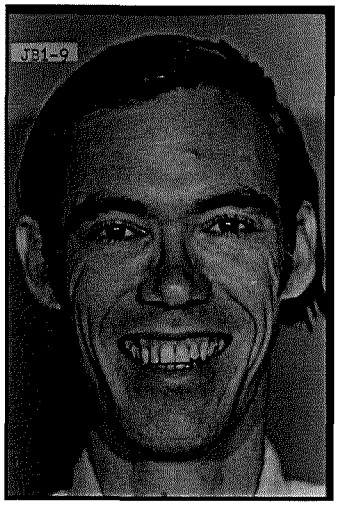


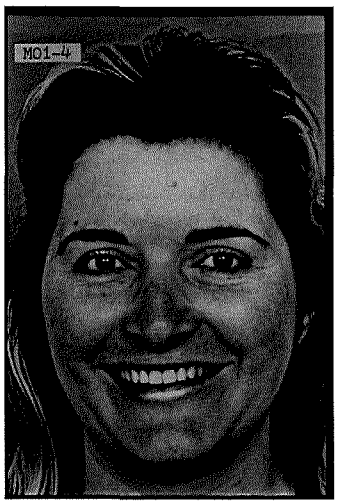


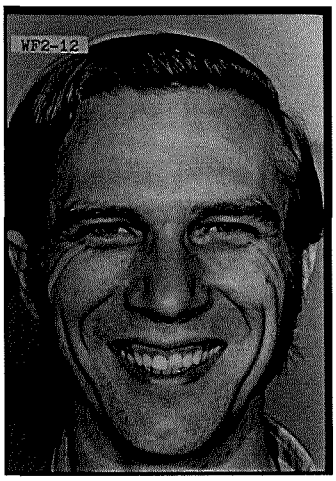


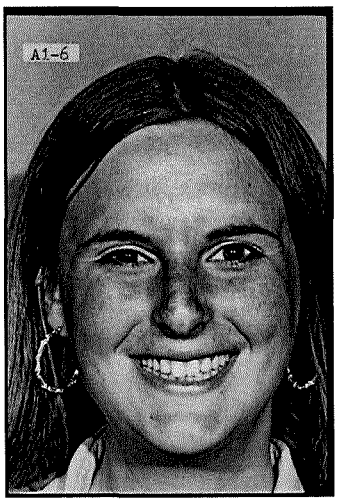
Happy face set



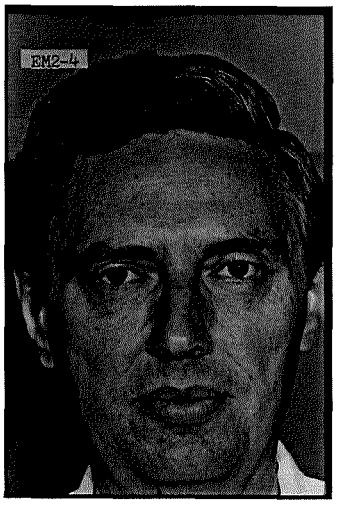


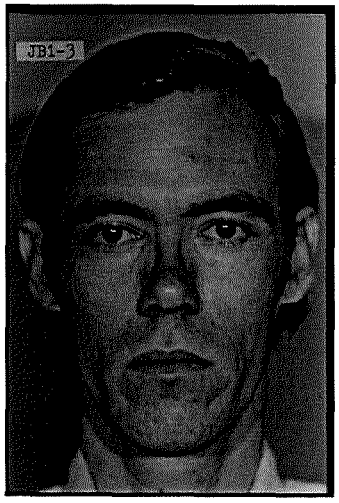


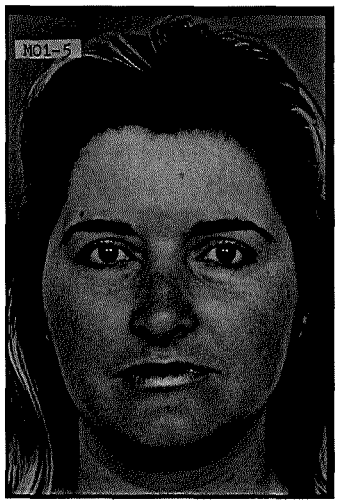


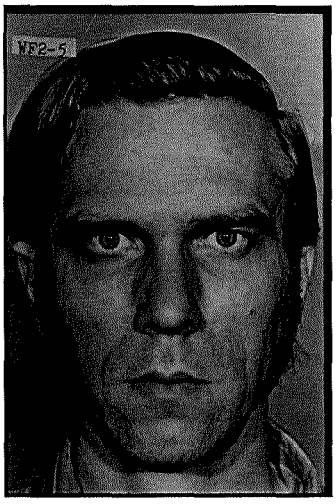


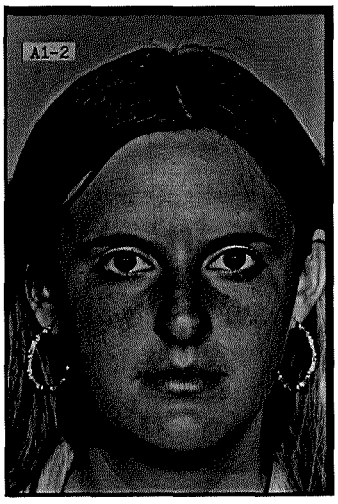
Neutral face set





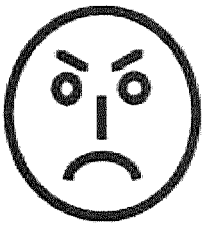




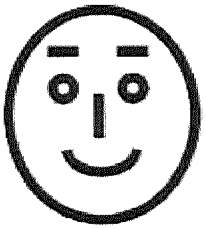


Schematic faces

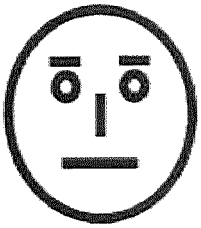
Angry (studies 6, 7 and 8)



Happy (studies 6 and 7)



Neutral (studies 6, 7 and 8)



Sad (Study 8)